N440BX Server Board
Product Guide

Order Number: 695449-001

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Server Board Features

Table 1. Server Board Features

Feature	Description
Processor	Installed: Up to two Pentium® II processors, packaged in single edge contact (S.E.C.) cartridges and installed in 242-pin Slot 1 processor connectors, operating at 1.8 V to 3.5 V. The system board's voltage regulator is automatically programmed by the processor's VID pins to provide the required voltage.
Memory, dynamic random access (DRAM)	Four 72-bit sockets for 100 MHz, PC/100 compliant, ECC or non-ECC, registered or unbuffered, SDRAM dual inline memory modules (DIMM).
Video memory	Installed: 2 MB of video memory.
PCI bus	Four PCI expansion slots for add-in boards (one slot shared with an ISA slot). 1x32 bit PCI bus. Embedded devices: video controller, Network Interface Controller (NIC), and SCSI controller.
ISA bus	Two ISA expansion slots for add-in boards (one slot shared with a PCI slot). Embedded PC-compatible support (serial, parallel, mouse, keyboard, diskette, and Plug and Play features).
Server Management	Thermal/voltage monitoring and error handling. Real-time clock/calendar (RTC). Front panel controls and indicators (LEDs). System Setup Utility (SSU). Basic Input/Output System (BIOS), Power On Self Test (POST), and Setup stored in flash memory.
Graphics	Integrated onboard Cirrus Logic CL-GD5480 super video graphics array (SVGA) controller.
SCSI	Symbios† SYM53C876 dual function controller providing ultra wide and legacy narrow SCSI interfaces.
Network	Integrated onboard NIC, an Intel 82558 PCI LAN controller for 10 or 100 Mbps TX Fast Ethernet† networks. RJ-45 Ethernet connector and indicator LEDs at I/O back panel.
System I/O	PS/2†-compatible keyboard and mouse ports, 6-pin DIN. Advanced parallel port, supporting Enhanced Parallel Port (EPP) level 1.7 and 1.9, ECP, compatible 25-pin. VGA† video port,15-pin. Two serial ports, 9-pin (serial port B is connected from the 10 pin header on the server board to the back panel via a provided ribbon cable). Network: RJ-45 Ethernet port.
Form Factor	Server AT† form-factor, 12 × 13 inches, ATX 2.01 compliant I/O.

Back Panel Connectors

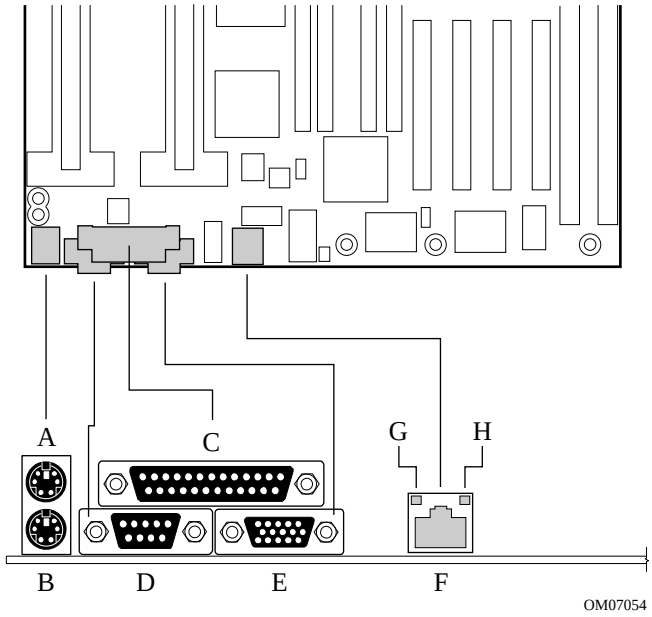

Figure 1. Back Panel Connectors

A. Mouse Connector
B. Keyboard Connector
C. Parallel Port Connector
D. Serial Port Connector
E. VGA Connector
F. Network Connector
G. Green NIC LED
H. Orange NIC LED

Table 2. NIC LEDs

NIC LED Color	If it's on	If it's blinking	If it's off
Orange	100 Mbps network connection.	NA	10 Mbps network connection.
Green	Linked to network, no network traffic.	Linked to network, sending or receiving data.	Not linked to network.

Server Board Connector and Component Locations

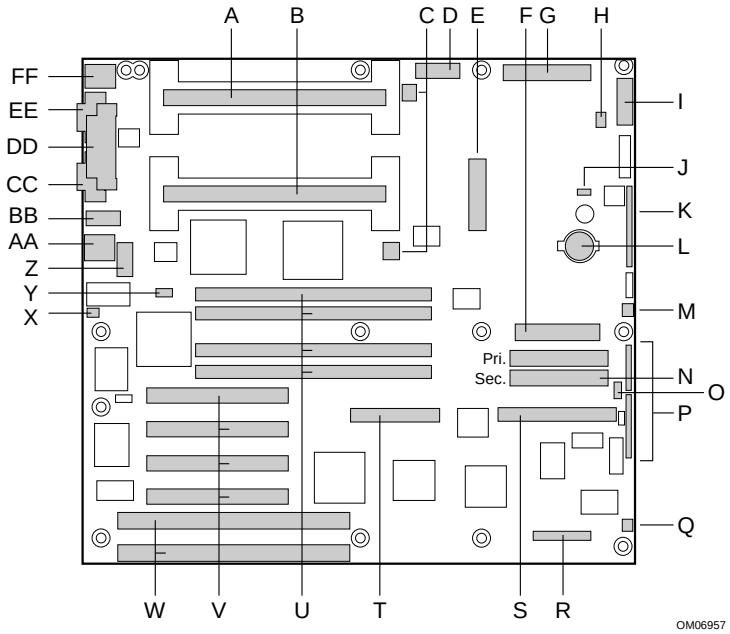

Figure 2. Server Board Connector and Component Locations

A. Secondary processor connector
B. Primary processor connector
C. Processor Heatsink fan connectors
D. Aux power connector
E. ATX power connector
F. Diskette drive connector
G. Main power connector
H. Hard drive LED connector
I. Front panel connector, 16 pin
J. Speaker connector
K. AT front panel connector
L. Lithium backup battery
M. System fan connector (fan1)
N. IDE connectors, primary and secondary
O. External IMB connector
P. Configuration jumper blocks
Q. System fan connector (fan2)
R. Server monitor module (SMM) connector
S. Narrow SCSI connector
T. Wide SCSI connector
U. Memory sockets for four DIMM components
V. PCI slots for add-in boards
W. ISA slots for add-in boards
X. Chassis intrusion connector
Y. Wake on LAN† enable jumper
Z. USB header
AA. RJ-45 network connector
BB. Serial port 2 header
CC. VGA monitor port
DD. Parallel port connector
EE. Serial port 1 connector
FF. Keyboard and Mouse PS/2 compatible connectors

Processor

Each Pentium II processor is packaged in a Single Edge Contact (S.E.C.) cartridge. The cartridge includes the processor core with an integrated 16 KB primary (L1) cache; the secondary (L2) cache; a thermal plate; and a back cover.

The processor implements the MMX™ technology and maintains full backward compatibility with the 8086, 80286, Intel386™, Intel486™, Pentium, Pentium Pro and Pentium II processors. The processor's numeric coprocessor significantly increases the speed of floating-point operations and complies with ANSI/IEEE standard 754-1985.

Each processor cartridge connects to the system board through a 242-pin edge connector. The cartridge is secured by a retention module attached to the system board. Depending on configuration, your system may have one or two processors.

The processor external interface is MP-ready and operates at 100 MHz. The processor contains a local APIC section for interrupt handling in MP and UP environments.

The second-level cache is located on the substrate of the S.E.C. cartridge. The cache includes burst pipelined synchronous static RAM (BSRAM). The L2 cache is offered in 512 KB configurations only, with error correcting code (ECC) that operates at half the core clock rate.

Memory

Only 100 MHz PC/100 ECC SDRAM is supported by the system board. Memory is partitioned as four banks of SDRAM DIMMs, each providing 72 bits of noninterleaved memory (64-bit main memory plus ECC):

- Install from 32 MB to 1 GB of memory, using registered DIMMs.
- Install from 32 MB to 512 MB of memory, using unbuffered DIMMs.

Memory should be added in order from slot 1 to slot 4.

NOTE

Do not mix registered and unbuffered memory. Non ECC memory maybe installed but is not recommended. Mixing Non-ECC memory and ECC memory causes all ECC features to be disabled.

Dual address strobe (RAS) signals are provided for each DIMM. When single-banked DIMMs are used, one of the RAS lines is connected to both 36-bit "halves" of the DIMM. When double-banked DIMMs are used (known as Dual RAS), both RAS lines are connected to two 36-bit "quarters" of the DIMM.

System memory begins at address 0 and is continuous (flat addressing) up to the maximum amount of DRAM installed (exception: system memory is noncontiguous in the ranges defined as memory holes using configuration registers). The system supports both base (conventional) and extended memory.

- Base memory is located at addresses 00000h to 9FFFFh (the first 640 KB).
- Extended memory begins at address 0100000h (1 MB) and extends to FFFFFFFFh (4 GB), the limit of addressable memory. The top of physical memory is a maximum of 1 GB (to 3FFFFFFFh).

Some operating systems and application programs use base memory—for example, MS-DOS†, OS/2†, and UNIX†. Other operating systems use both conventional and extended memory—for example, OS/2 and UNIX. MS-DOS does not use extended memory; however, some MS-DOS utility programs such as RAM disks, disk caches, print spoolers, and windowing environments use extended memory for better performance.

The controller automatically detects, sizes, and initializes the memory array, depending on the type, size, and speed of the installed DIMMs, and reports memory size and allocation to the system via configuration registers.

NOTE

DIMM sizes and compatibility: use DIMMs that have been tested for compatibility with the system board. Contact your sales representative or dealer for a current list of approved memory modules. The table below lists some sample size combinations.

Table 3. Sample DIMM Component Combinations

Bank 0 (slot J1)	Bank 1 (slot J2)	Bank 2 (slot J3)	Bank 3 (slot J4)	Total memory
32				32 MB
32	32			64 MB
32	32	128		192 MB
32	32	128	128	320 MB
32	128	128	128	416 MB
128	128	128	128	512 MB

Peripherals

Super I/O Chip

The National 87309 device supports two serial ports, one parallel port, diskette drive, PS/2-compatible keyboard and mouse, and integrated Real Time Clock (RTC). The server board provides a connector interface for each port.

Serial Ports

Both serial ports are relocatable. By default, port A appears at the onboard DB9 connector and port B on the 10-pin header. Each serial port can be set to one of four different COMx ports and can be enabled separately. When enabled, each port can be programmed to generate edge- or level-sensitive interrupts. When disabled, serial port interrupts are available to add-in boards. In order to use both ports, you need to connect a ribbon cable from the 10-pin header on the server board to the I/O panel.

Parallel Port

The 87309 provides one IEEE 1284-compatible 25-pin bidirectional EPP (supporting levels 1.7 and 1.9). BIOS programming of the 87309 registers enable the parallel port and determine the port address and interrupt. ECP mode is supported with 2 possible DMA channels. When disabled, the interrupt is available to add-in boards.

Add-in Board Slots

The system board has two full-length ISA bus connectors. One of the connectors shares a chassis expansion slot with a PCI connector. ISA features:

- Bus speed up to 8.33 MHz
- 16-bit memory addressing
- Type A transfers at 5.33 Mbps
- Type B transfers at 8 Mbps
- 8- or 16-bit data transfers
- Plug and Play ready

The system board has four full-length PCI connectors. One of the connectors shares a chassis expansion slot with an ISA connector. PCI features:

- Bus speed up to 33 MHz
- 32-bit memory addressing
- 5 V signaling environment
- Burst transfers of up to 133 Mbps
- 8-, 16-, or 32-bit data transfers
- Plug and Play ready
- Parity enabled

Video

The onboard, integrated Cirrus Logic CL-GD5480 64-bit VGA chip contains an SVGA controller that is fully compatible with these video standards: CGA†, EGA†, Hercules† Graphics, MDA†, and VGA. The standard configuration comes with 2 MB of 10 ns onboard video memory. The video controller supports pixel resolutions of up to 1600 x 1200 and up to 16.7 M colors.

The SVGA controller supports analog VGA monitors (single and multiple frequency, interlaced and noninterlaced) with a maximum vertical retrace noninterlaced frequency of 100 Hz.

You cannot add video memory to this system. Depending on the environment, the controller displays up to 16.7 M colors in some video resolutions. It also provides hardware-accelerated bit block transfers (BITBLT) of data.

SCSI Controller

The system board includes a Symbios Logic SYM53C876 embedded dual-function, PCI SCSI host adapter. The SYM53C876 contains two independent SCSI controllers that share a single PCI bus master interface as a multi-function device. Internally, each controller is identical, capable of operations using either 8- or 16-bit SCSI providing 10 MB/s (Fast-10) or 20 MB/s (Fast-20) throughput, or 20 MB/s (Ultra) or 40 MB/s (Ultra-wide). As implemented on the system board, controller A attaches to a 68-pin 16-bit (wide) SCSI connector interface, controller B attaches to a 50-pin 8-bit (narrow) SCSI connector interface. Each controller has its own set of PCI configuration registers and SCSI I/O registers. As a PCI 2.1 bus master the SYM53C876 supports burst data transfers on PCI up to the maximum rate of 132 MB/sec using on-chip buffers.

No logic, termination, or resistor loads are required to connect devices to the SCSI controller other than termination in the device at the end of the cable. The SCSI bus is terminated on the system board with active terminators that cannot be disabled. The onboard device must always be at one end of the bus.

IDE Controller

IDE is a 16-bit interface for intelligent disk drives with AT disk controller electronics onboard. The PCI/ISA/IDE Accelerator, also known as PIIX4, is a multifunction device on the system board that acts as a PCI-based Fast IDE controller. The device controls:

- PIO and IDE DMA/bus master operations
- Mode 4 timings
- Transfer rates up to 22 MB/sec
- Buffering for PCI/IDE burst transfers
- Master/slave IDE mode
- Up to two devices per channel; two channels, IDE0 and IDE1

NOTE

18-inch maximum length of IDE cable on each channel: you can connect an IDE signal cable, up to a maximum of 18 inches each, to each IDE connector on the system board. Each cable can support two devices, one at the end of the cable and one 6 inches from the end of the cable.

Network Controller

The system board includes a 10BASE-T/100BASE-TX network solution based on the Intel 82558 Fast Ethernet PCI Bus Controller. As a PCI bus master, the controller can burst data at up to 132 MB/sec. The controller contains two receive and transmit FIFO buffers that prevent data overruns or underruns while waiting for access to the PCI bus. The controller has the following:

- 32-bit PCI bus master interface (direct drive of bus), compatible with *PCI Bus Specification, Revision 2.1*
- Chained memory structure with improved dynamic transmit chaining for enhanced performance
- Programmable transmit threshold for improved bus utilization
- Early receive interrupt for concurrent processing of receive data
- On-chip counters for network management
- Autodetect and autoswitching for 10 or 100 Mbps network speeds
- Support for both 10 Mbps and 100 Mbps networks, capable of full or half duplex, with back-to-back transmit at 100 Mbps

The network status LEDs on the system board indicate:

- Transmit/receive activity on the LAN
- Valid link to the LAN
- 10/100 Mbps transfer mode

Keyboard and Mouse

The keyboard/mouse controller is PS/2-compatible. The system may be locked automatically if there is no keyboard or mouse activity for a predefined length of time, if specified through the System Setup Utility (SSU). Once the inactivity (lockout) timer has expired, the keyboard and mouse do not respond until the previously stored password is entered.

Server Management

Server Management features are implemented using one microcontroller.

Server Board Management Controller (BMC)

All server management functionality is concentrated in the BMC. The BMC and associated circuitry are powered from + 5V_Standby, which remains active when system power is switched off and the system is still plugged into AC power.

One major function of the BMC is to autonomously monitor system management events, and log their occurrence in the non-volatile System Event Log (SEL). These include events such as over-temperature and over-voltage conditions, fan failure, or chassis intrusion. To enable accurate monitoring, the BMC maintains the non-volatile Sensor Data Record (SDR), from which sensor information can be retrieved. The BMC provides an ISA host interface to SDR sensor information, so software running on the server can poll and retrieve the server's current status.

SEL contents can be retrieved after system failure, for analysis by field service personnel using system management tools, such as Intel LANDesk® Server Manager. Since the BMC is powered by 5V_Standby, SEL (and SDRR) information is also available via the IMB. An Emergency Management Card, such as the Intel LANDesk SMM card, can obtain the SEL and make it remotely accessible using a LAN or telephone line connection. While it receives the proper current, the BMC performs the following functions:

- Baseboard temperature and voltage monitoring
- VID Bit reading
- Processor presence monitoring and FRB control
- Baseboard fan failure detection and indicator control
- SEL interface management
- SDR Repository interface management
- SDR/SEL timestamp clock
- Baseboard Field Replaceable Unit (FRU) information interface
- System management watchdog timer
- Periodic SMI timer
- Front panel NMI handling
- Event receiver
- ISA host and IMB interface management
- Secure mode control, video blank and floppy write protect monitoring and control, front panel lock/unlock initiation.
- Sensor event initialization agent
- Wake on LAN via Magic Packet† support

Security

To help prevent unauthorized entry or use of the system, the system includes server management software that monitors the system intrusion switch.

Security with Mechanical Locks and Monitoring

If installed, you can activate the chassis intrusion alarm switch. When the side door is opened, the switch transmits an alarm signal to the system board, where server management software processes the signal. The system can be programmed to respond to an intrusion by powering down or by locking the keyboard, for example.

Software Locks

The BIOS Setup and the System Setup Utility (SSU) provide a number of security features to prevent unauthorized or accidental access to the system. Once the security measures are enabled, you can access the system only after you enter the correct password(s). For example:

- Enable the keyboard lockout timer so that the server requires a password to reactivate the keyboard and mouse after a specified time-out period—1 to 120 minutes.
- Set and enable an administrative password.
- Set and enable a user password.
- Set secure mode to prevent keyboard or mouse input and to prevent use of the front panel reset and power switches.
- Activate a hot-key combination to enter secure mode quickly.
- Disable writing to the diskette drive when secure mode is set.

Using Passwords

You can set either the user password, the administrator password, or both passwords. If only the user password is set, you:

- Must enter the user password to enter BIOS Setup or the SSU.
- Must enter the user password to boot the server if Password on Boot is enabled in either the BIOS Setup or SSU.
- Must enter the user password to exit secure mode.

If only the administrator password is set, you:

- Must enter the administrator password to enter BIOS Setup or the SSU.
- Must enter the administrator password to boot the server if Password on Boot is enabled in either the BIOS Setup or SSU.
- Must enter the administrator password to exit secure mode.

If both passwords are set, you:

- May enter the user password to enter BIOS Setup or the SSU. However, you will not be able to change many of the options.
- Must enter the administrator password if you want to enter BIOS Setup or the SSU and have access to all of the options.

- May enter either password to boot the server if Password on Boot is enabled in either the BIOS Setup or SSU.
- May enter either password to exit secure mode.

Secure Mode

Configure and enable the secure boot mode by using the SSU. When secure mode is in effect:

- You can boot the system and the operating system will run, but you must enter the user password to use the keyboard or mouse.
- You cannot turn off system power or reset the system from the front panel switches.

Secure mode has no effect on functions enabled via the Server Manager Module or power control via the real-time clock.

Taking the system out of secure mode does not change the state of system power. That is, if you press and release the power switch while secure mode is in effect, the system will not be powered off when secure mode is later removed. However, if the front panel power switch remains depressed when secure mode is removed, the system will be powered off.

Summary of Software Security Features

The table below lists the software security features and describes what protection each offers. In general, to enable or set the features listed here, you must run the SSU and go to the Security Subsystem Group, menu. The table also refers to other SSU menus and to the Setup utility.

Table 4. Software Security Features

Feature	Description
Secure mode	How to enter secure mode: In either the BIOS Setup or the SSU, set either password and enable one, or more, of the secure mode features: Secure Mode Timer - if the system is inactive for longer than the set limit, it enters secure mode. Secure Mode Hot Key - you can secure the system simply by pressing the key combination. This means you do not have to wait for the inactivity time-out period. Secure Mode on Boot - the system boots directly into secure mode. When the system is in secure mode: The system can boot and run the operating system, but mouse and keyboard input is not accepted until the user password is entered. At boot time, if a CD is detected in the CD-ROM drive or a diskette in drive A, the system prompts for a password. When the password is entered, the system boots from CD or diskette and disables the secure mode. If there is no CD in the CD-ROM drive or diskette in drive A, the system boots from a hard drive and automatically goes into secure mode. All enabled secure mode features go into effect at boot time. To leave secure mode: Enter the correct password.

continued

Table 4. Software Security Features (continued)

Feature	Description
Disable writing to diskette	In secure mode, the system will not boot from or write to a diskette unless a password is entered. To set this feature, use the SSU Security Subsystem Group. To write-protect access to diskette whether the system is in secure mode or not, use the Setup main menu, Floppy Options, and specify Floppy Access as read only.
Disable the power and reset buttons	Enable the feature through the SSU. Then the power and reset buttons are disabled when the system is in secure mode.
Set a time-out period so that keyboard and mouse input are not accepted Also, screen can be blanked, and writes to diskette can be inhibited	Specify and enable an inactivity time-out period of from 1 to 120 minutes. If no keyboard or mouse action occurs for the specified period, attempted keyboard and mouse input will not be accepted. The monitor display will go blank, and the diskette drive will be write-protected (if these security features are enabled through Setup or the SSU). To resume activity: Enter the correct password(s).
Control access to using the SSU: set administrative password	To control access to setting or changing the system configuration, set an administrative password and enable it through Setup or the SSU. If both the administrative and user passwords are enabled, either can be used to boot the system or enable the keyboard and/or mouse, but only the administrative password will allow Setup and the SSU to be changed. To disable a password, change it to a blank entry or press CTRL-D in the Change Password menu of the Administrative Password Option menu found in the Security Subsystem Group. To clear the password if you cannot access Setup or the SSU, change the Clear Password jumper (see Chapter 5).
Control access to the system other than SSU: set user password	To control access to using the system, set a user password and enable it through Setup or the SSU. To disable a password, change it to a blank entry or press CTRL-D in the Change Password menu of the User Password Option menu found in the Security Subsystem Group. To clear the password if you cannot access Setup or the SSU, change the Clear Password jumper (see Chapter 5).
Boot without keyboard	The system can boot with or without a keyboard. During POST, before the system boots, the BIOS automatically detects and tests the keyboard if it is present and displays a message. There is no entry in the SSU to enable or disable a keyboard.
Specify the boot sequence	The sequence that you specify on the menu in the SSU Multi-Boot Group will determine the boot order. If secure mode is enabled (a user password is set), then you will be prompted for a password before the system fully boots. If secure mode is enabled and the “Secure Boot Mode” option is also enabled, the system will fully boot but will require a password before accepting any keyboard or mouse input.

2 Upgrading

Tools and Supplies Needed

- Phillips (cross-head) screwdriver (#1 bit and #2 bit)
- Jumper removal tool or needle-nosed pliers
- Pen or pencil
- Antistatic wrist strap and conductive foam pad (recommended)

Warnings and Cautions

These warnings and cautions apply throughout this chapter. Only a technically qualified person should configure the system board.

⚠ WARNINGS

System power on/off: The power button DOES NOT turn off the system AC power. To remove power from system, you must unplug the AC power cord from the wall outlet.

Hazardous conditions, devices & cables: Hazardous electrical conditions may be present on power, telephone, and communication cables. Turn off the system and disconnect the power cord, telecommunications systems, networks, and modems attached to the system before opening it. Otherwise, personal injury or equipment damage can result.

⚠ CAUTIONS

Electrostatic discharge (ESD) & ESD protection: ESD can damage disk drives, boards, and other parts. We recommend that you perform all procedures in this chapter only at an ESD workstation. If one is not available, provide some ESD protection by wearing an antistatic wrist strap attached to chassis ground—any unpainted metal surface—on your system when handling parts.

ESD and handling boards: always handle boards carefully. They can be extremely sensitive to ESD. Hold boards only by their edges. After removing a board from its protective wrapper or from the system, place it component-side up on a grounded, static-free surface. Use a conductive foam pad if available but not the board wrapper. Do not slide board over any surface.

Installing or removing jumpers: a jumper is a small plastic-encased conductor that slips over two jumper pins. Some jumpers have a small tab on top that you can grip with your fingertips or with a pair of fine needle-nosed pliers. If your jumpers do not have such a tab, take care when using needle-nosed pliers to remove or install a jumper; grip the narrow sides of the jumper with the pliers, never the wide sides. Gripping the wide sides can damage the contacts inside the jumper, causing intermittent problems with the function controlled by that jumper. Take care to grip with, but not squeeze, the pliers or other tool you use to remove a jumper, or you may bend or break the stake pins on the board.

Server Board

Removing the Server Board

⚠ CAUTIONS

The system board can be extremely sensitive to ESD and always requires careful handling. After removing it from the system, place it component-side up on a nonconductive, static-free surface to prevent shorting out the battery leads. If you place the board on a conductive surface, the battery leads may short out. This will result in a loss of CMOS data and will drain the battery. Do not slide the system board over any surface.

If you place the system board on a conductive surface, the battery leads may short out. If they do, this will result in a loss of CMOS data and will drain the battery.

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Open the system and remove peripherals and components blocking access to the system board. See your chassis manual for more information.
3. Label and disconnect all internal cables connected to add-in boards.
4. Remove all add-in boards.
5. Label and disconnect all internal cables connected to the system board.
6. Remove the system board retaining screws and set them aside.
7. Remove the system board, and place it component-side up on a nonconductive, static-free surface or in an antistatic bag.
8. If present, remove and save the EMI gasket that covers the I/O connectors on the board.

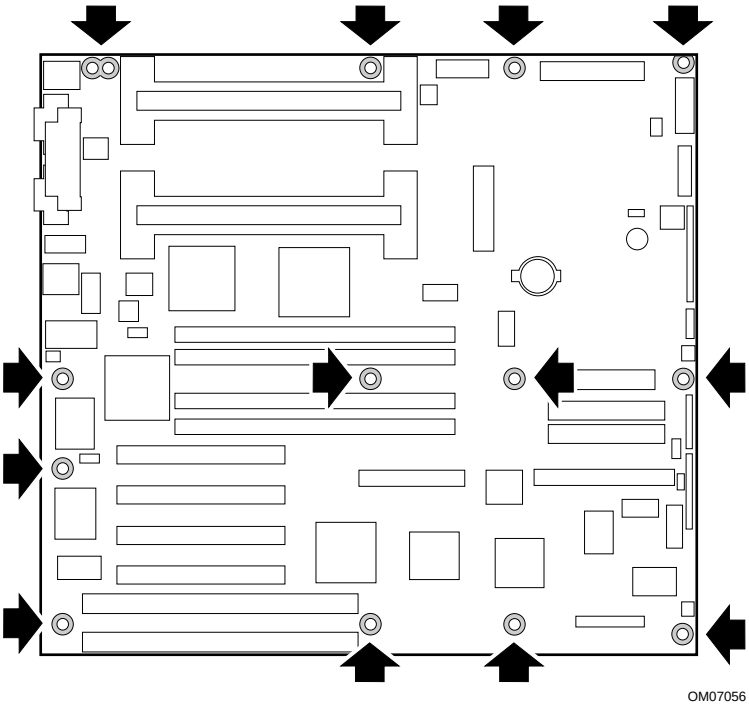

Figure 3. Server Board Screw Hole Locations

Installing the Server Board

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. If available, place the EMI gasket over the I/O connectors on the system board.
3. Insert screws through the mounting holes and into the threaded standoffs. Make sure the board is properly seated, and then tighten all the screws firmly (6.0 inch-pounds).
4. Connect all internal cables to the system board.
5. Reinstall add-in boards.
6. Connect all internal cables to add-in boards. Make sure you connect the power cables to the correct power connectors.
7. Connect all peripheral device cables to the I/O panel on the rear of the system.
8. Run the SSU to configure the system.

Memory

Installing DIMMs

⚠ CAUTIONS

Use extreme care when installing a DIMM. Applying too much pressure can damage the socket. DIMMs are keyed and can be inserted in only one way.

Mixing dissimilar metals may cause later memory failures resulting in data corruption. Install DIMMs with gold plated edge connectors only in gold plated sockets.

See Chapter 1 for memory size and requirements:

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Open your system.
3. Holding the DIMM only by its edges, remove it from its antistatic package.
4. Orient the DIMM so that the two notches in the bottom edge of the DIMM align with the keyed socket.
5. Insert the bottom edge of the DIMM into the socket, and press down firmly on the DIMM until it seats correctly.
6. Gently push the plastic ejector levers on the socket ends to the upright position.
7. Repeat the steps to install each DIMM.
8. Close the system.
9. Connect all external cables and the power cord to the system.
10. Turn on the monitor and then the system.

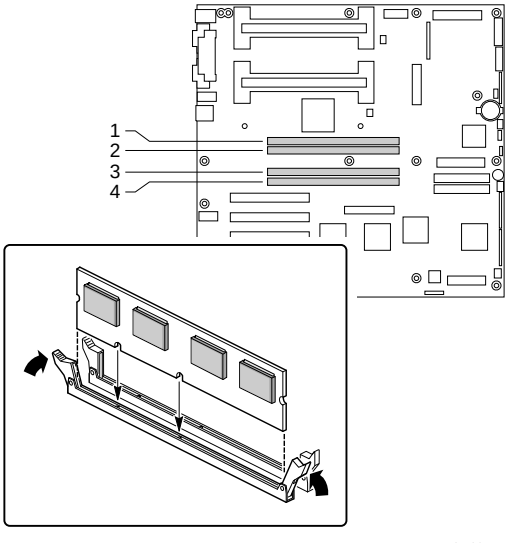

Figure 4. Installing DIMMs

Removing DIMMs

⚠ CAUTION

Use extreme care when removing a DIMM. Too much pressure can damage the socket slot. Apply only enough pressure on the plastic ejector levers to release the DIMM.

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Open the system.
3. Gently push the plastic ejector levers out and down to eject a DIMM from its socket.
4. Hold the DIMM only by its edges, being careful not to touch its components or gold edge connectors. Carefully lift it away from the socket, and store it in an antistatic package.
5. Repeat to remove other DIMMs as necessary.
6. Close the system.
7. Connect all external cables and the power cord to the system.
8. Turn on the monitor and then the system.

Processors

⚠ WARNING

If the system has been running, any installed processor and heat sink on the processor board(s) will be hot. To avoid the possibility of a burn, be careful when removing or installing system board components that are located near processors.

⚠ CAUTIONS

Processor must be appropriate: You may damage the system if you install a processor that is inappropriate for your system. Make sure your system can handle a newer, faster processor (thermal and power considerations). For exact information about processor interchangeability, contact your customer service representative.

Heat sink must be appropriate: Depending on your configuration, the existing processor may have a passive heat sink. If you REPLACE the processor with a faster one, it must have a fan heat sink (powered fan instead of a passive heat sink). If you ADD a second processor, it must have a fan heat sink. When adding a processor, you must leave the existing one in Slot 1 primary connector (closest to the center of the system board).

ESD and handling processors: Reduce the risk of electrostatic discharge (ESD) damage to the processor by doing the following: (1) Touch the metal chassis before touching the processor or system board. Keep part of your body in contact with the metal chassis to dissipate the static charge while handling the processor. (2) Avoid moving around unnecessarily.

Removing a Processor

1. Observe the safety and ESD precautions at the beginning of this chapter and the additional cautions given here. If the processor has a fan heat sink, disconnect the power wire (B in the figure below) from the connector on the system board (C).
2. As you work, place boards and processors on a grounded, static-free surface or conductive foam pad.
3. Press the processor latches toward the center of the S.E.C. cartridge to free them from the retention module (A).
4. Lift the S.E.C. cartridge upward, out of the retention module.
5. Put the processor in a piece of conductive foam and store in an antistatic package.

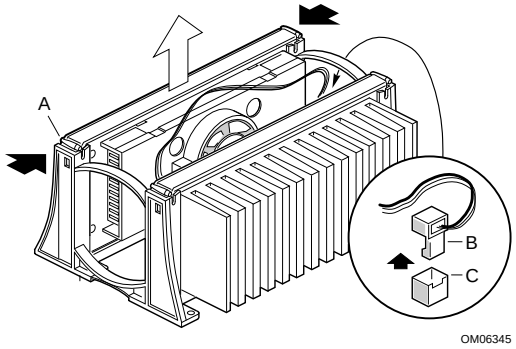

Figure 5. Removing a Processor

A. Processor latches; must be pushed inward until free from retention module
B. Fan heat sink power cable; must plug into processor fan connector on system board
C. Processor fan connector

Installing a Processor

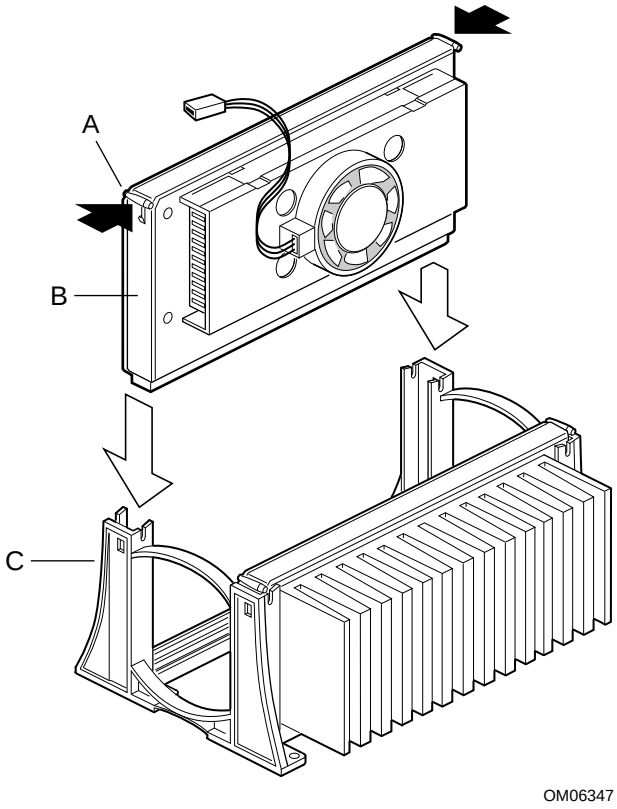

Figure 6. Installing a Second Processor

A. Processor latches
B. Processor in S.E.C. cartridge
C. Retention module

1. Observe the safety and ESD precautions at the beginning of this chapter and the additional cautions given here.
2. If your system has one processor and you are ADDING a second, then you must remove the termination board from the secondary processor connector. Press the tabs on the top of the termination board (A in figure) toward each other to release them from the retention module. Lift the board up and out of the retention module (B), and store it appropriately.

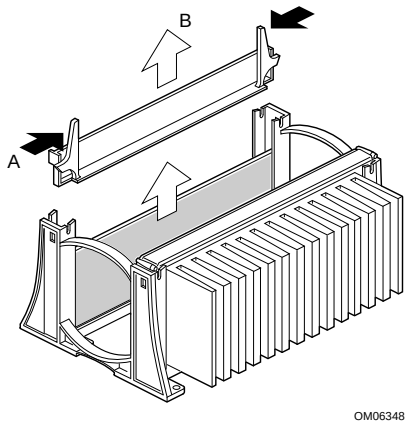

Figure 7. Removing a Termination Board

3. If your system has one processor and you are REPLACING it, leave the termination board intact in the empty Slot 1 secondary connector. Remove the processor you want to replace. See “Removing a Processor” on page 26.
4. If your system has two processors and you are REPLACING one or both, remove the appropriate one(s). See “Removing a Processor” on page 26.
5. Remove the new processor from its antistatic package and place it on a grounded, static-free surface or conductive foam pad.
6. Orient the processor so that the heat sink faces the center of the system board. Slide the processor into the retention module. Ensure that the alignment notch in the S.E.C. cartridge fits over the plug in Slot 1. Push down firmly, with even pressure on both sides of the top, until the S.E.C. cartridge is seated.
7. To lock in the processor, push the latches outward until they click into place in the retention module (A in figure, below). The latches must be secured for proper electrical connection of the processor.
8. Attach the small end of the power cable to the fan connector on the S.E.C. cartridge, then attach the large end (B) to the three-pin connector on the system board (C).

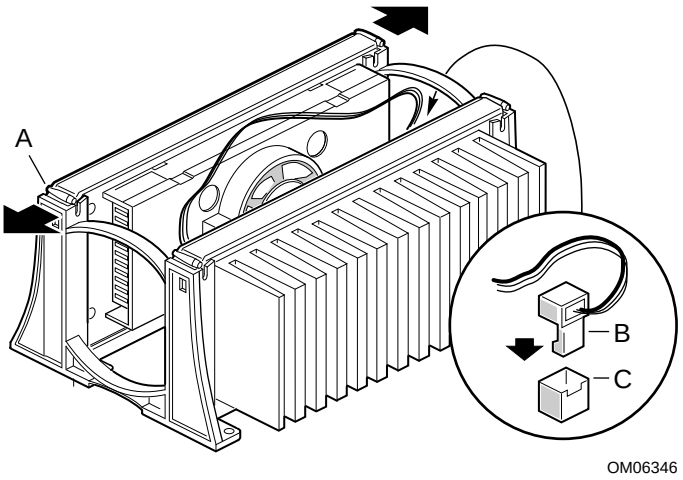

Figure 8. Locking in the Processor

A. Processor latches; must be pushed outward until they click into retention module
B. Fan heat sink power cable; must plug into processor fan connector on system board
C. Processor fan connector

9. After you have installed the processor, you must configure its speed.

Replacing the Back-up Battery

The lithium battery on the system board powers the real-time clock (RTC) for up to 10 years in the absence of power. When the battery starts to weaken, it loses voltage, and the system settings stored in CMOS RAM in the RTC (for example, the date and time) may be wrong. Contact your customer service representative or dealer for a list of approved devices.

The following warning and translations are required by specific certifying agencies to be printed immediately adjacent to the procedure for removing the real-time clock.

WARNING

Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the equipment manufacturer. Discard used batteries according to manufacturer's instructions.

ADVARSEL!

Lithiumbatteri - Eksplosionsfare ved fejlagtig håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type. Levér det brugte batteri tilbage til leverandøren.

ADVARSEL

Lithiumbatteri - Eksplosjonsfare. Ved utskifting benyttes kun batteri som anbefalt av apparatfabrikanten. Brukt batteri returneres apparatleverandøren.

VARNING

Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion.

VAROITUS

Paristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

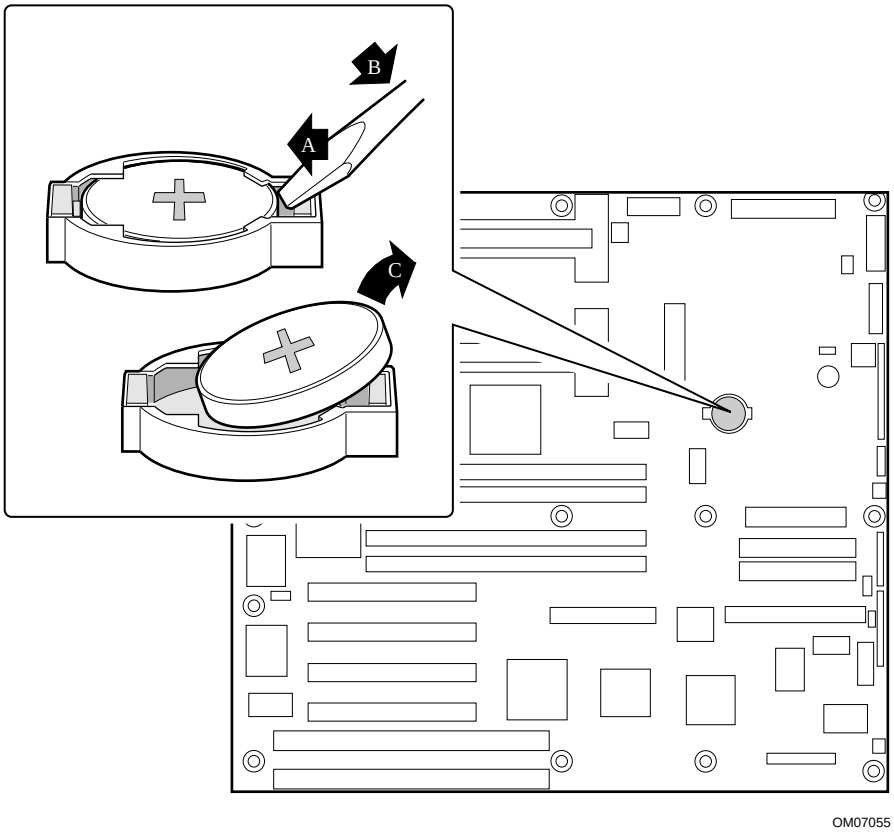

Figure 9. Replacing the Lithium Battery

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Open the chassis.
3. Insert the tip of a small flat-bladed screw driver, or equivalent, under the plastic tab on the San-in plastic retainer (A in figure).
4. Gently push down on the screwdriver to lift the battery (B).
5. Remove the battery from its socket (C).
6. Dispose of the battery according to local ordinance.
7. Remove the new lithium battery from its package, and, being careful to observe the correct polarity, insert it in the battery socket.
8. Reinstall the plastic retainer on the lithium battery socket.
9. Close the chassis.
10. Run the SSU to restore the configuration settings to the RTC.

3 Configuration Software and Utilities

This chapter describes the Power-on Self Test (POST) and system configuration utilities. The table below briefly describes the utilities.

Table 5. Configuration Utilities

Utility	Description and brief procedure	Page
BIOS Setup	If the system does not have a diskette drive, or the drive is disabled or misconfigured, use Setup to enable it. Or, you can move the CMOS jumper on the system board from the default setting (Protect CMOS memory) to the Clear setting; this will allow most system configurations to boot. For the procedure to do this, see the section "CMOS Jumper" in Chapter 5 in this manual. Then run the SSU to configure the system.	35
System Setup Utility (SSU)	Use for extended system configuration of onboard resources and add-in boards, and for viewing the system event log, setting boot device priority, or setting system security options. The SSU may be run from either the Server Configuration CD or from a DOS-bootable diskette. Information entered via the SSU overrides information entered via Setup.	48
EMP Console	Use to access and monitor the server remotely.	56
FRUSDR Load Utility	Use to update the Field Replacement Unit (FRU), Sensor Data Record (SDR), and Desktop Management Interface (DMI) flash components.	69
BIOS Update Utility	Use to update the BIOS or recover from a corrupted BIOS update.	75
Firmware Update Utility	Use to update BMC flash ROM.	78
Using the Symbios SCSI Utility	Use to configure or view the settings of the SCSI host adapters and onboard SCSI devices in the system.	78

Hot Keys

Use the keyboard's numeric pad to enter numbers and symbols.

Table 6. Hot Keys

To do this:	Press these keys
Clear memory and reload the operating system—this is a system reset.	<Ctrl+Alt+Del>
Secure your system immediately.	<Ctrl+Alt>+hotkey (Set your hot-key combination with the SSU or Setup.)

Power-on Self Test (POST)

Each time you turn on the system, POST starts running. POST checks the system board, processor, memory, keyboard, and most installed peripheral devices. During the memory test, POST displays the amount of memory that it is able to access and test. The length of time needed to test memory depends on the amount of memory installed. POST is stored in flash memory.

1. Turn on your video monitor and system. After a few seconds POST begins to run.
2. After the memory test, these screen prompts and messages appear:

```
Press <F2> key if you want to run SETUP

Keyboard.....Detected

Mouse........Detected
```

3. If you do not press <F2> and do NOT have a device with an operating system loaded, the above message remains for a few seconds while the boot process continues, and the system beeps once. Then this message appears:

```
Insert bootable media in the appropriate drive
```

   If you do not press <F2> and DO have an operating system loaded, the boot process continues, and this message appears:

```
Press <Ctrl><C> to enter SCSI Utility
```

4. Press <Ctrl+C> if there are SCSI devices installed. When the utility opens, follow the displayed instructions to configure the onboard SCSI host adapter settings and to run the SCSI utilities. Also see “Using the Symbios SCSI Utility” on page 78. If you do not enter the SCSI utility, the boot process continues.
5. Press <Esc> during POST to pop up a boot menu when POST finishes. From this menu you can choose the boot device or enter BIOS Setup.

After POST completes, the system beeps once.

What appears on the screen after this depends on whether you have an operating system loaded and if so, which one.

If the system halts before POST completes running, it emits a beep code indicating a fatal system error that requires immediate attention. If POST can display a message on the video display screen, it causes the speaker to beep twice as the message appears.

Note the screen display and write down the beep code you hear; this information is useful for your service representative. For a listing of beep codes and error messages that POST can generate, see the “Solving Problems” chapter in this manual.

Using BIOS Setup

This section describes the BIOS Setup options. Use Setup to change the system configuration defaults. You can run Setup with or without an operating system being present. Setup stores most of the configuration values in battery-backed CMOS; the rest of the values are stored in flash memory. The values take effect when you boot the system. POST uses these values to configure the hardware; if the values and the actual hardware do not agree, POST generates an error message. You must then run Setup to specify the correct configuration.

Run Setup: you may run Setup to modify any standard PC AT† system board feature such as:

- Select diskette drive
- Select parallel port
- Select serial port
- Set time/date (to be stored in RTC)
- Configure IDE hard drive
- Specify boot device sequence
- Enable SCSI BIOS
- Specify processor speed

Run SSU, not Setup: you must run the SSU instead of Setup to do the following:

- Add or remove any ISA board that is not Plug and Play-compatible
- Enter or change information about a board
- Alter system resources (such as interrupts, memory addresses, I/O assignments) to user-selected choices instead of choices selected by the BIOS resource manager

Record Your Setup Settings

If the default values ever need to be restored (after a CMOS-clear, for example), you must run Setup again. Referring to the worksheets could make your task easier.

If You Cannot Access Setup

If the diskette drive is misconfigured so that you cannot access it to run a utility from a diskette, you may need to clear CMOS memory. You will need to open the system, change a jumper setting, use Setup to check and set diskette drive options, and change the jumper back. For a step-by-step procedure, see Chapter 5, under the heading, “CMOS Jumper.”

Starting Setup

You can enter and start Setup under several conditions:

- When you turn on the system, after POST completes the memory test
- When you reboot the system by pressing <Ctrl+Alt+Del> while at the DOS operating system prompt
- When you have moved the CMOS jumper on the system board to the “Clear CMOS” position (enabled); for the procedure, see Chapter 5, under the heading “CMOS Jumper”

In the three conditions listed above, after rebooting, you will see this prompt:

```
Press <F2> to enter SETUP
```

In a fourth condition, when CMOS/NVRAM has been corrupted, you will see other prompts but not the <F2> prompt:

```
Warning:  cmos checksum invalid
Warning:  cmos time and date not set
```

In this condition, the BIOS will load default values for CMOS and attempt to boot.

Setup Menus

Setup has six major menus and several submenus:

1. Main Menu
   - Primary IDE Master and Slave
   - Secondary Master and Slave
   - Keyboard Features
2. Advanced Menu
   - PCI Configuration
     - ⇒ PCI Device, Embedded SCSI
     - ⇒ PCI Device, Slot 1 - Slot 4
   - Integrated Peripheral Configuration
   - Advanced Chipset Control
3. Security Menu
4. Server Menu
   - System Management
     - ⇒ Server Management Information
   - Console Redirection
5. Boot Menu
   - Boot Device Priority
   - Hard Drive
   - Removable Devices
6. Exit Menu

To:	Press
Get general help	<F1> or <Atl+H>
Move between menus	← →
Go to the previous item	↑
Go to the next Item	↓
Change the value of an item	+ or -
Select an item or display a submenu	<Enter>
Leave a submenu or exit Setup	<Esc>
Reset to Setup defaults	<F9>
Save and exit Setup	<F10>

When you see this:	What it means
On screen, an option is shown but you cannot select it or move to that field.	You cannot change or configure the option in that menu screen. Either the option is autoconfigured or autodetected, or you must use a different Setup screen, or you must use the SSU.
On screen, the phrase Press Enter appears next to the option.	Press <Enter> to display a submenu that is either a separate full-screen menu or a pop-up menu with one or more choices.

The rest of this section lists the features that display onscreen after you press <F2> to enter Setup. Not all of the option choices are described, because (1) a few are not user-selectable but are displayed for your information, and (2) many of the choices are relatively self-explanatory.

Main Menu

You can make the following selections on the Main Menu itself. Use the submenus for other selections.

Feature	Choices	Description
System Time	HH:MM:SS	Sets the system time.
System Date	MM/DD/YYYY	Sets the system date.
Legacy Diskette A:	Disabled 360KB 1.2 MB 720KB **1.44/1.25 MB** 2.88 MB	Selects the diskette type.
Legacy Diskette B:	**Disabled** 360KB 1.2 MB 720KB 1.44/1.25 MB 2.88 MB	
Primary IDE Master		Enters submenu.
Primary IDE Slave		Enters submenu.
Secondary IDE Master		Enters submenu.
Secondary IDE Slave		Enters submenu.
Keyboard Features		Enters submenu.
Memory Cache	**Enabled** Disabled	Enables processor cache.
CPU Speed Setting (for 100 MHz FSB processors. The BIOS will detect the FSB speed and display the appropriate values.)	200 MHz 250 MHz 300 MHz 350 MHz 400 MHz 450 MHz 500 MHz	Sets the speed for the installed processor(s). **CAUTION** Setting this higher than the proper speed for the installed processor(s) may cause damage to the processor(s).
CPU Speed Setting (for 66 MHz FSB processors. The BIOS will detect the FSB speed and display the appropriate values.)	133 MHz 166 MHz 200 MHz 233 MHz 266 MHz 300 MHz 333 MHz 366 MHz 400 MHz 433 MHz 466 MHz 500 MHz 533 MHz	Sets the speed for the installed processor(s). **CAUTION** Setting this higher than the proper speed for the installed processor(s) may cause damage to the processor(s).
Language	**English (US)** Français Español Deutsch Italiano	Selects which language BIOS displays.

Primary/Secondary IDE Master and Slave Submenu

Feature	Choices	Description
Type	**Auto** None CD-ROM IDE Removable ATAPI Removable User	Auto forces the system to attempt auto-detection of the drive type. None informs the system to ignore this drive. CD ROM allows the manual entry of some fields described below. IDE Removable allows the manual entry of some fields described below. ATAPI Removable allows the manual entry of some fields described below. User allows the manual entry of all fields described below.
Cylinders	0 to 65535	Number of Cylinders on Drive. This field is changeable only for Type User.
Heads	1 to 16	Number of read/write heads on drive. This field is available only for Type User.
Sectors	0 to 63	Number of sectors per track. This field is available only for Type User.
Maximum Capacity	N/A	Computed size of drive from cylinders, heads, and sectors entered. This field is informational only for Type User.
Multi-Sector Transfer	**Disabled** 2, 4, 8, or 16 sectors	Determines the number of sectors per block for multi-sector transfers. This field is informational only for Type Auto.
LBA Mode Control	**Disabled** Enabled	Enabling LBA causes logical block addressing to be used in place of cylinders, heads, and sectors. This field is informational only for Type Auto.
32 Bit I/O	**Disabled** Enabled	Enabling allows 32 bit IDE data transfers.
Transfer Mode	Standard Fast PIO 1 Fast PIO 2 Fast PIO 3 **Fast PIO 4** FPIO 3 / DMA 1 FPIO 4 / DMA 2	Selects the method for moving data to and from the drive. This field is informational only for Type Auto.
Ultra DMA Mode	**Disabled** Mode 0 Mode 1 Mode 2	Selects the Ultra DMA mode used for moving data to/from the drive.

Keyboard Submenu

Feature	Choices	Description
Num Lock	On **Off**	Selects the power-on state for Num Lock.
Key Click	**Disabled** Enabled	Enables or disables the audible key click.
Keyboard auto-repeat rate	**30/sec** 26.7/sec 21.8/sec 18.5/sec 13.3/sec 10/sec 6/sec 2/sec	Sets the numbers of time per second a key will repeat while it is held down.
Keyboard auto-repeat delay	1/4 sec **1/2 sec** 3/4 sec 1 sec	Sets the delay before a key starts to repeat when it is held down.

Advanced Menu

You can make the following selections on the Advanced Menu itself. Use the submenus for the three other selections that appear on the Advanced Menu.

Feature	Choices	Description
Plug and Play OS	**No** Yes	Select Yes if you are booting a Plug and Play capable operating system.
Reset Configuration Data	**No** Yes	Select Yes if you want to clear the system configuration data during next boot. System automatically resets to No in next boot.
Enable ACPI	**No** Yes	Select Yes if you want to turn on the Advanced Configuration and Power Interface (ACPI).
PCI Configuration		Enters submenu.
Integrated Peripherals Configuration		Enters submenu.
Advanced Chipset Control		Enters submenu.
Use Multiprocessor Specification	**1.1** 1.4	Selects the version of multiprocessor specification to use. Some operating systems do not support version 1.4.
Large Disk Access Mode	**DOS** Other	Select DOS if your OS is DOS, or Other for UNIX, Novell† NetWare†, or other OS. A large disk has more than 1024 cylinders, more than 16 heads, or more than 63 tracks per sector.
Delay on Option ROMs	**Disabled** Enabled	Forces a short delay at the end of each Option ROM scan.

PCI Configuration Submenu

The PCI Configuration Menu only contains selections that access other submenus.

PCI Device, Embedded SCSI Submenu

Feature	Choices	Description
Option ROM Scan	**Enabled** Disabled	Enables option ROM scan of the onboard Symbios SCSI chip. There are 2 SCSI channels that are controlled by the same option ROM.
Enable Master	**Enabled** Disabled	Enabled selects the device as a PCI bus master.
Latency Timer	Default 0020h **0040h** 0060h 0080h 00A0h 00C0h 00E0h	Minimum guaranteed time, in units of PCI bus clocks, that a device may be master on a PCI bus. ⚠ **CAUTION** Do not change this setting unless you fully understand the priority of this device on the PCI bus.

PCI Device, Slot 1 - Slot 4 Submenus

Feature	Choices	Description
Enable Master	**Enabled** Disabled	Enables selected device as a PCI bus master.
Latency Timer	Default 020h **040h** 060h 080h 0A0h 0C0h 0E0h	Minimum guaranteed time, in units of PCI bus clocks, that a device may be master on a PCI bus. ⚠ **CAUTION** Do not change this setting unless you fully understand the priority of this device on the PCI bus.

Integrated Peripheral Configuration Submenu

Feature	Choices	Description
COM 1	Disabled **Enabled** Auto OS Controlled	 Auto forces BIOS to configure the port. Forces the OS to configure the port.
Base I/O Address	**3F8** 2F8 3E8 2E8	Selects the base I/O address for COM 1.
Interrupt	IRQ 3 **IRQ 4**	Selects the IRQ for COM 1.
COM 2	Disabled **Enabled** Auto PnP OS	 Auto forces BIOS to configure the port. PnP OS forces OS configures the port.
Base I/O Address	3F8 **2F8** 3E8 2E8	Selects the base I/O address for COM 2.
Interrupt	IRQ 3 **IRQ 4**	Selects the IRQ for COM 2.
Parallel Port	Disabled **Enabled** Auto PnP OS	 Auto forces BIOS to configure the port. PnP OS forces OS configures the port.
Mode	Output only Bi-directional EPP **ECP**	Selects parallel port mode.
Base I/O Address	**378** 278	Selects the base I/O address for LPT port.
Interrupt	IRQ 5 **IRQ 7**	Selects the IRQ for LPT port.
DMA channel	**DMA 1** DMA 3	Selects the DMA for LPT port (only used for ECP mode).
Floppy disk controller	Disabled **Enabled**	Enables onboard diskette controller.

Advanced Chipset Control

Feature	Choices	Description
640-768K Memory Region	**Enabled** Disabled	Enabled forwards ISA Master and DMA cycles to the PCI bus. Disabled forwards these cycles to memory.
Delayed Transaction	**Enabled** Disabled	Enables the delayed transaction mechanism when the PIIX4 is the target of a PCI transaction.
Passive Release	**Enabled** Disabled	Enables the passive release mechanism on the PHOLD# signal when the PIIX4 is a PCI Master.

Security Menu

You can make the following selections on the Security Menu itself. Enabling the Supervisor Password field requires a password for entering Setup. The passwords are not case sensitive.

Feature	Choices	Description
User Password is	**Clear** Set	Status only; user cannot modify. Once set, this can be disabled by setting it to a null string, or by clearing password jumper on system board.
Administrator Password is	**Clear** Set	Status only; user cannot modify.
Set User Password	Press Enter	When the <Enter> key is pressed, you are prompted for a password; press ESC key to abort. Once set, this can be cleared by setting it to a null string, or by clearing password jumper on system board (see Server Board Jumpers in Chapter 5).
Set Administrator Password	Press Enter	When the <Enter> key is pressed, you are prompted for a password; press ESC key to abort. Once set, this can be cleared by setting it to a null string, or by clearing password jumper on system board (see Server Board Jumpers in Chapter 5).
Password on Boot	**Disabled** Enabled	Requires password entry before boot. System will remain in secure mode until password is entered. Password on Boot takes precedence over Secure Mode Boot.
Diskette Access	**Administrator** User	Controls access to diskette drives.
Fixed Disk Boot Sector	**Normal** Write Protect	Write-protects boot sector on hard disk to protect against viruses.
Secure Mode Timer	**Disabled** 1 min 2 min 5 min 10 min 20 min 1 hr 2 hr	Period of key/PS/2 mouse inactivity specified for secure mode to activate. A password is required for secure mode to function. Cannot be enabled unless at least one password is enabled.
Secure Mode Hot Key (Ctrl-Alt-)	[ ] [A, B, ..., Z]	Key assigned to start the Quicklock feature. Cannot be enabled unless at least one password is enabled.
Secure Mode Boot	**Disabled** Enabled	System will boot in secure mode. You must enter a password to unlock the system. Cannot be enabled unless at least one password is enabled.
Video Blanking	Disabled Enabled	Blank video when secure mode is activated. You must enter a password to unlock the system. Cannot be enabled unless at least one password is enabled.
Floppy Write Protect	**Disabled** Enabled	When secure mode is activated, the diskette drive is write protected. You must enter a password to disable. Cannot be enabled unless at least one password is enabled.
Front Panel Lockout	**Disabled** Enabled	When secure mode is activated, the reset and power switches are locked. You must enter a password to unlock the system. Cannot be enabled unless at least one password is enabled.

Server Menu

You can make the following selections on the Server Menu itself.

Feature	Choices	Description
System Management		Enters submenu.
Console Redirection		Enters submenu.
PCI IRQs to IO-APIC mappings	Disabled **Enabled**	Enabled - BIOS can describe all 24 IO APIC pins in the MP table for PCI interrupts. Not all MP operating systems and drivers can understand this description of the interrupts in the MP table. Disabled - BIOS will only use 16 IO APIC pins in the MP table for PCI interrupts. All PCI interrupts are routed to a standard ISA IRQ pins on IO APIC. All operating systems will work with standard ISA IRQ entries.
Processor Retest	Yes **No**	Yes tells BIOS to clear the historical processor status and retest all processors on the next boot. BIOS automatically resets to No in next boot.

System Management Submenu

Feature	Choices	Description
Server Management Mode	Disabled **Enabled**	Enabled loads the embedded server management firmware.
System Event Logging	Disabled **Enabled**	When enabled, system events will be logged by BIOS and BMC in system event log.
Clear Event Log	**No** Yes	Yes clears the system event log (SEL) in BMC.
SMM Debug Mode	**Disabled** Enabled	If enabled, the BIOS will output to video and Port 80.
Server Management Info		Enters submenu.
EMP Password switch	**disabled** enabled	Sets the EMP password.
EMP Password	**[A..Z, 0..9]**	This field only shows up when the EMP password switch is enabled. Entering a password and pressing return will send the password immediately to the BMC. If a beep is heard the password was not accepted. If no password is entered, anyone has access to the server through the EMP Console.
EMP Escape sequence	**+++**	Sets the escape sequence for the modem being used for EMP. This will force the modem to command mode. This is only used if the EMP direct connect mode is set to modem.
EMP Hangup Line String	**ATH**	Sets the Hangup Line Sequence for the modem being used for EMP. Only used in EMP modem mode.

continued

System Management Submenu (continued)

Feature	Choices	Description
Modem Init String	**AT&F0S0=1S14=0&D**	Sets the initialization string for the modem being used for EMP. Only used in EMP modem mode. This field is only 16 characters long. High modem Init string field is a continuation of the Modem Init string to be able to enter in another 4 characters.
High Modem Init String	**0**	This is a continuation of the Modem Init string. When 16 characters are typed into the Modem Init string are entered this field will pop up to allow another 4 characters to be typed in.
EMP Access Mode	Pre-boot Only Always Active **Disabled**	Pre-boot Only - EMP is only enabled during power down through end of POST. Com 2 is returned to system use at the end of Post when operating system boots. Always Active - EMP is always enabled. Com 2 cannot be used by operating system. It is now dedicated for EMP use. Disabled - EMP is disabled. Com 2 is always available for system use by console redirection or operating system.
EMP Restricted Mode Access	**Disabled** Enabled	If set to Enabled, Power on/off and Reset server controls via EMP are no longer available.
EMP Direct Connect/Modem Mode	**Direct Connect** Modem Mode	Sets how EMP connects to the server. Direct Connect means a null modem serial cable directly connects COM 2 connector port to the EMP console machine. Modem mode indicates that a modem is connected on COM 2 for EMP use.

Server Management Information Submenu

Items on this menu can not be modified. If items require changes, consult your system administrator.

Feature	Choices	Description
Board Part Number	N/A	Information field only
Board Serial Number	N/A	Information field only
System Part Number	N/A	Information field only
System Serial Number	N/A	Information field only
Chassis Part Number	N/A	Information field only
Chassis Serial Number	N/A	Information field only
BMC Revision	N/A	Information field only
Primary HSBP Revision	N/A	Information field only

Console Redirection Submenu

Feature	Choices	Description
COM Port Address	**Disabled** 3F8 2F8 3E8	When enabled, console redirection uses the I/O port specified. 3F8 - typically is COM 1 2F8 - typically is COM 2 All keyboard/mouse and video will be directed to this port. This is designed to be used only under DOS in text mode.
IRQ #	3 or 4 **None**	When console redirection is enabled, this displays the IRQ assigned per the address chosen in the COM Port Address field. COM port address is disabled None is automatically selected.
Baud Rate	9600 **19.2k** 38.4k 115.2k	When console redirection is enabled, use the baud rate specified.
Console Type	**PC ANSI**	Sets the terminal emulation protocol that the remote console will see.
Flow Control	No Flow Control CTS/RTS XON/XOFF **CTS/RTS + CD**	Disables flow control. CTS/RTS is hardware flow control. XON/XOFF is software flow control. CTS/RTS +CD is hardware plus carrier-detect for modem use. When carrier detect is lost modem will drop phone connection.

Boot Menu

You can make the following selections on the Boot Menu itself.

Feature	Choices	Description
Floppy Check	**Disabled** Enabled	If Enabled, system verifies diskette type on boot. Disabled results in a faster boot.
Boot Device Priority		Enters submenu.
Hard Drive		Enters submenu.
Removable Devices		Enters submenu.

Boot Device Priority

Use the up or down arrow keys to select a device, then press the <+> or <-> keys to move the device higher or lower in the boot priority list.

Boot Priority	Device	Description
1.	Removable Devices	Attempts to boot from a removable media device.
2.	Hard Drive	Attempts to boot from a hard drive device.
3.	ATAPI CD-ROM Drive	Attempts to boot from an ATAPI CD-ROM drive.
4.	LANDesk Service Agent II	Loads LANDesk service Agent and attempts to boot off of a remote agent on the embedded network interface card (Intel 82558).

Hard Drive

For options on this menu, use the up or down arrow keys to select a device, then press the <+> or <-> keys to move the device higher or lower in the boot priority list.

Option	Description
1. Hard Drive #1 (or actual drive string)	IDE drives will have a suffix attached to the drive ID string. PM - hard drive on Primary Master Channel PS - hard drive on Primary Slave Channel SM - hard drive on Secondary Master Channel SS - hard drive on Secondary Slave Channel SCSI CD-ROMs will be displayed here because the onboard Symbios SCSI bios treats CD-ROMs as hard drives. SCSI zip or removable drives will also appear here. Removable IDE zip drives will only show up if the removable media is formatted as a hard drive.
2. Other Bootable Device	Covers all the boot devices that are not reported to the system BIOS through the BIOS boot specification mechanism. This includes all PCI cards that are not bios boot compliant (legacy) as well as ISA cards that are not PnP compliant. ISA legacy cards will boot first before non bios boot compliant PCI cards (in scan order from lowest slot to highest).

Removable Devices

For options on this menu, use the up or down arrow keys to select a device, then press the <+> or <-> keys to move the device higher or lower in the boot priority list.

Option	Description
1. Legacy Floppy Drive	Refers to the onboard 3.5” floppy drive. Removable IDE media may also show up here if the removable media was formatted in floppy emulation.

Exit Menu

You can make the following selections on the Exit Menu. Select an option using the up or down arrow keys, then press <Enter> to execute the option. Pressing <Esc> does not exit this menu. You must select one of the items from the menu or menu bar to exit.

Choices	Description
Exit Saving Changes	Exits after writing all modified Setup item values to NVRAM.
Exit Discarding Changes	Exits leaving NVRAM unmodified.
Load Custom Defaults	Loads default values for all Setup items.
Save Custom Defaults	Saves present Setup values to custom defaults.
Load Default Values	Loads values of all Setup items from previously saved custom defaults.
Discard Changes	Reads previous values of all Setup items from NVRAM.
Save Changes	Writes all Setup item values to NVRAM.

Using the System Setup Utility

The System Setup Utility (SSU) is on the Server System Configuration Software CD shipped with the server. The SSU provides a graphical user interface (GUI) over an extensible framework for server configuration. For the N440BX systems, the SSU framework supports the following functions and capabilities:

- assigns resources to baseboard devices and add-in cards prior to loading the operating system (OS)
- allows you to specify boot device order and system security options
- permits viewing and clearing of the system's critical event log
- allows troubleshooting of the server when the OS is not operational
- provides a system level view of the server's I/O devices

When to Run the System Setup Utility

The SSU is a DOS-based utility that supports extended system configuration operations for onboard resources and add-in boards. You can also view the system event log and to set system boot and security options. Use the SSU when you need to

- add and remove boards affecting the assignment of resources (ports, memory, IRQs, DMA)
- modify the server's boot device order or security settings
- change the server configuration settings
- save the server configuration
- view or clear the system event log

If you install or remove an ISA add-in board, you must run the SSU to reconfigure the server. Running the SSU is optional for PCI and Plug and Play ISA add-in boards.

The SSU is PCI-aware, and it complies with the ISA Plug and Play specifications. The SSU works with any compliant configuration (.CFG) files supplied by the peripheral device manufacturer.

The I/O baseboard comes with a .CFG file. The .CFG file describes the characteristics of the board and the system resources that it requires. The configuration registers on PCI and ISA Plug and Play add-in boards contain the same type of information that is in a .CFG file. Some ISA boards also come with a .CFG file.

The SSU uses the information provided by .CFG files, configuration registers, FLASH, and the information that you enter, to specify a system configuration. The SSU writes the configuration information to flash memory.

The SSU stores configuration values in FLASH memory. These values take effect when you boot the server. POST checks the values against the actual hardware configuration; if they do not agree, POST generates an error message. You must then run the SSU to specify the correct configuration before the server boots.

The SSU always includes a checksum with the configuration data so the BIOS can detect any potential data corruption before the actual hardware configuration takes place.

What You Need to Do

The SSU may be run directly from the Server Configuration Software CD or from a set of DOS diskettes.

If you choose to run the SSU from a set of DOS diskettes, you must copy the SSU from the Server Configuration Software CD to a set of DOS diskettes and follow the instructions in the included README.TXT file to prepare the diskettes.

If your diskette drive is disabled, or improperly configured, you must use the flash-resident Setup utility to enable it so that you can use the SSU. If necessary, you can disable the drive after you exit the SSU. Information entered using the SSU overrides any entered using Setup.

Running the SSU

- **Running the SSU Locally**

  Running the ssu.bat file provided on the SSU media starts the SSU. If the server boots directly from the SSU media, the ssu.bat file is automatically run. If it boots from a different media, the SSU can be started manually or by another application. When the SSU starts in the local execution mode (the default mode), the SSU accepts input from the keyboard and/or mouse. The SSU presents a VGA-based Graphical User Interface (GUI) on the primary monitor.

  The SSU runs from writable, nonwritable, removable, and nonremovable media. If the SSU is run from nonwritable media, user preference settings (such as screen colors) can not be saved.

  The SSU supports the ROM-DOS V6.22 operating system. It may run on other ROM-DOS compatible operating systems but they are not supported. The SSU will not operate from a "DOS-box" running under an operating system such as Windows†.

- **Running the SSU Remotely**

  Running the SSU remotely requires a remote server with a Server Monitor Module 2 (SMM2) card and a local system with Remote Control software available.

  The SMM2 card provides video memory, keyboard, and mouse redirection support for the remote server. The Remote Control console of the local system displays and sends video memory and user input to the remote server through either a modem or an Ethernet link. Because the SSU runs exclusively on the remote server, any files required for the SSU to run must be available on the remote server (on removable or nonremovable media).

  If you connect the local system to the remote server through a network or modem you can see the console, control the mouse, and control the keyboard of the remote server.

Starting the SSU

SSU consists of a collection of task-oriented modules plugged into a common framework called the Application Framework (AF). The Application Framework provides a launching point for individual tasks and a location for setting customization information. For full functionality the SSU requires the availability of the AF.INI, AF.HLP, plus any .ADN files and their associated .HLP and .INI files.

1. Turn on your video monitor and your system.
2. There are two ways to start the SSU.
   a. **After creating set of SSU diskettes from the CD:** Insert the first SSU diskette in drive A, and press the reset button or <Ctrl+Alt+Del> to reboot your server from the diskette.
   b. **Directly from the Server Configuration Software CD:** Insert the Server Configuration CD into your CD-ROM drive and press the reset button or <Ctrl-Alt-Del> to reboot. When prompted to do so, press <F2> to enter BIOS Setup. From the Boot Menu, select the Boot Device Priority option and then select CD-ROM as your primary boot device. Save those settings and exit BIOS Setup. The server will boot from the CD-ROM and display a menu of options. Follow the instructions in the menu to start the SSU.
3. When the SSU title appears on the screen, press <Enter> to continue.
4. The mouse driver loads if it is available; press <Enter> to continue.
5. This message appears:

```
Please wait while the Application Framework loads....
```

6. When the main window of the SSU appears, you can customize the user interface before continuing.

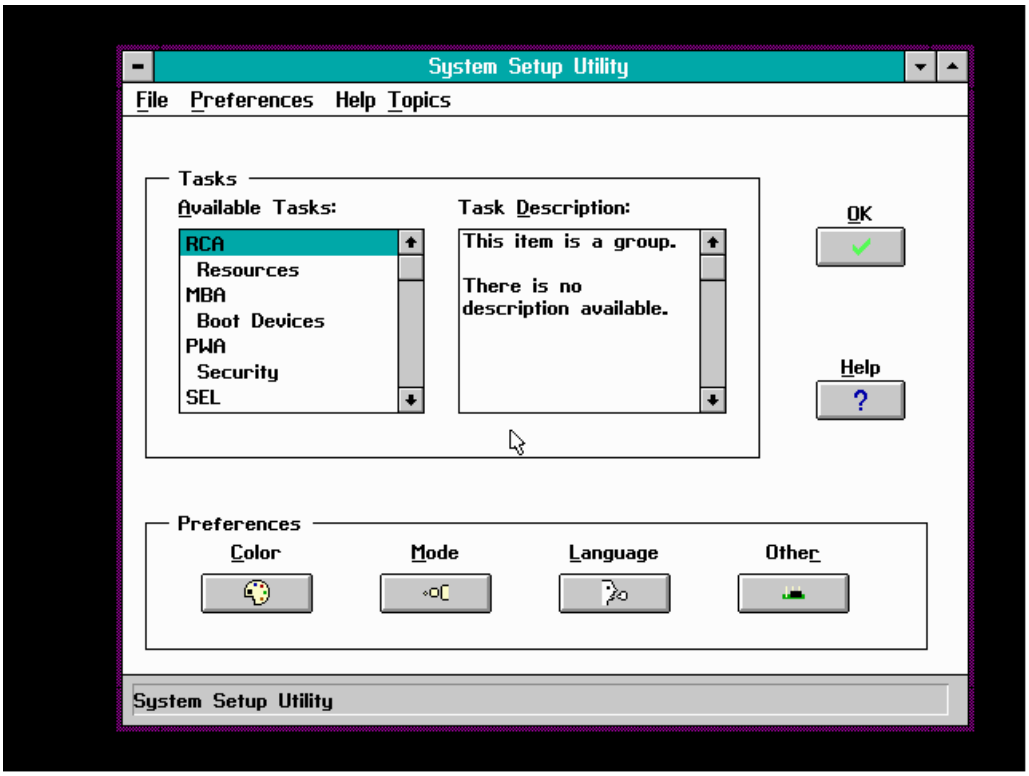

Figure 10. System Setup Utility Main Window

Customizing the SSU

The SSU lets you customize the user interface according to your preferences. The AF sets these preferences and saves them in the AF.INI file so that they take effect the next time you start the SSU. There are four user-customizable settings:

- **Color—**this button lets you change the default colors associated with different items on the screen with predefined color combinations. The color changes are instantaneous.
- **Mode—**this button lets you set the desired expertise level.
  - novice
  - intermediate
  - expert

  The expertise level determines which tasks are visible in the Available Tasks section and what actions each task performs. For a new mode setting to take effect, you must exit the SSU and restart it.
- **Language—**this button lets you change the strings in the SSU to strings of the appropriate language. For a new language setting to take effect, you must exit the SSU and restart it.
- **Other—**this button lets you change other miscellaneous options in the SSU. The changes are instantaneous.

To change the interface default values:

Use the mouse to click on the proper button in the Preferences section of the SSU Main window.

or

Use the tab and arrow keys to highlight the desired button, and press the spacebar or <Enter>.

or

Access the menu bar with the mouse or hot keys (Alt + underlined letter).

NOTE

If you run the SSU from nonwritable media (like a CD-ROM), these preferences will be lost when you exit the SSU.

Launching a Task

It is possible to have many tasks open at the same time, although some tasks may require complete control to avoid possible conflicts. The tasks achieve complete control by keeping the task as the center of operation until you close the task window.

To launch a task:

1. In the SSU Main window, double-click on the task name under Available Tasks to display the main window for the selected task.

   or

   Highlight the task name, and click on OK.

   or

   Use the tab and arrow keys to highlight the desired button, and press the spacebar or <Enter>.

Resource Configuration Add-in (RCA) Window

The RCA provides three major functions:

- Creates representations of devices that cannot be discovered by the system (ISA cards)
- Modifies the contents of the system by adding and removing devices
- Modifies the resources used by devices

You can use the RCA window to define an ISA card or add an ISA card by clicking on the appropriate button. Removing an ISA card requires that the card be highlighted in the Devices section of the screen before clicking on the button. You can only add as many ISA cards as you have ISA slots available.

1. From the SSU main window, launch the RCA by selecting the "Resources" task under the RCA heading in the task box.
2. When the RCA window appears, it displays messages similar to the following:

```
Baseboard:  System Board

PCI Card: Bus 00 dev 00 -– Host Processor Bridge

PCI Card: Bus 00 dev 0D –- Multifunction Controller

PCI Card: Bus 00 dev 0F –- Ethernet Controller

PCI Card: Bus 00 dev 12 –- Multifunction Controller

PCI Card: Bus 00 dev 14 –- VGA Controller
```

3. To configure a device, select its name in the Devices section of the RCA window, and press the spacebar or <Enter>, or click on it.
4. It is possible to close the RCA window and return to the AF by clicking on the Close button. Any changes made will be kept in memory for use by the RCA when it is rerun.
5. Save all the changes made by clicking on the Save button. Saving writes your current configuration to nonvolatile storage where it will be available to the system after every reboot.
6. Closing the window by clicking on the system menu, the dash in the upper-left corner, discards all changes.

Defining an ISA Card

An ISA card usually comes with a vendor-created .CFG file that specifies the resources the card requires to function properly. If the .CFG file is unavailable, you must manually create it or define the card through the SSU. Defining an ISA card consists of specifying the name of the card and the resources it consumes. This allows the RCA to consider the ISA card resource requirements when the RCA tries to resolve conflicts. The information is also used by the system BIOS to configure the hardware when the system is booted.

1. To add or remove ISA card resources, click on the appropriate resource buttons, select the desired value, and click on Add or Remove.
2. After you complete the necessary information, click on Save.
3. To edit a card, click on Load to retrieve the card information. After making changes, click on Save.
4. To create a card, click on New.
5. To remove a current definition of a card, click on Delete.

Adding and Removing ISA Cards

Adding and removing cards through the RCA provides a way for the RCA to run its conflict detection algorithms on the resources requested by the cards. This alerts you to any possible problems with that particular card in the current configuration.

- **To add an ISA card:**
  1. Click on Add ISA Card in the RCA window.
  2. Specify the directory for the .CFG file.
  3. Select the file and click on Ok.
- **To remove an ISA card:**
  1. Select a valid ISA card in the Devices section of the RCA window.
  2. Click on Remove ISA Card.

Modifying Resources

Modifying the resources of a device may be necessary to accommodate certain operating systems, applications, and drivers. It may also be necessary to modify resources to resolve a conflict.

- **To modify the resources associated with a device:**
  1. Highlight the device in the Devices section of the RCA window.
  2. Press the spacebar or <Enter>, or double-click on the entry.

  This displays the functions of the selected device along with possible choices and the resources associated with those choices.

- **To make a modification:**
  1. Highlight the function in the Configuration window.
  2. Press the spacebar or <Enter>, or double-click on the entry (this updates the Choice and resource lists).
  3. Press the tab key to get to the Choice list, and press <Enter>.
  4. Use the arrow keys to select a proper choice, and press <Enter> again.
  5. If the choice allows multiple possible values for a particular resource, use the hot key to select a resource, and press the spacebar or double click on the resource.
  6. Select the desired resource, and click on Ok.

System Resource Usage

Clicking on the Resource Use button in the Configuration window displays the System Resource Usage window. This window shows what resources each device is consuming. This information is useful for choosing resources if a conflict occurs. Devices can be organized according to the resources you want to examine using the options in the Resource section of the screen. The resource information can also be written to a plain text file through this window.

Multiboot Options Add-in

Under this window you can change the boot priority of a device.

1. Select a device.
2. Press the + button to move it up in the list. Press the - button to move it down.

Security Add-in

Under this window, you can set the User and Administrator passwords, and security options.

To Set the User Password

1. Click on the user password button.
2. Enter the password in the first field.
3. Confirm the password by entering it again in the second field.

To Change or Clear the User Password

1. Click on the User password button.
2. Enter the old password in the first field.
3. Enter the new password in the second field (or leave blank to clear).
4. Confirm the password by entering it again in the second field (or leave blank to clear).

To Set the Administrator Password

1. Click on the Administrator password button.
2. Enter the password in the first field.
3. Confirm the password by entering it again in the second field.

To Change or Clear the Administrator Password

1. Click on the Administrator password button.
2. Enter the old password in the first field.
3. Enter the new password in the second field (or leave blank to clear).
4. Confirm the password by entering it again in the second field (or leave blank to clear).

Security Options

Under this window, you can set the other security options:

- **Hot Key** - set a key sequence that, when pressed, will drop the server into secure mode.
- **Lock-Out Timer** - set an interval that, if no activity takes place during it, will drop the server into secure mode.
- **Secure Boot Mode** - force the server to boot directly into secure mode.
- **Video Blanking** - turn off the video when the server is in secure mode.
- **Floppy Write** - control access to the diskette drive while the server is in secure mode.
- **Reset/Power Switch Locking** - control the power and reset buttons while the server is in secure mode.

SEL Viewer Add-in

Clicking on the SELU Add-in task brings up the Server Event Log (SEL) viewer. You can load and view the current SEL data stored in the BMC, save the currently loaded SEL data to a file, view previously saved SEL data, or clear the SEL. The SEL Viewer has the following menus:

File

The File menu has the following options:

- **Load SEL…** View data from a previously saved SEL file.
- **Save SEL…** Save the currently loaded SEL data to a file.
- **Clear SEL** Clears the SEL data from the BMC.
- **Exit** Quits the SEL Viewer.

View

The View menu has the following options:

- **SEL Info** Displays information about the SEL. These fields are display only.
- **All Events** Displays the current SEL data from the BMC.
- **By Sensor** Brings up a pop-up menu that allows you to view only the data from a certain sensor type.
- **By Event** Brings up a pop-up menu that allows you to view only the data from a certain event type.

Settings

The Settings menu has the following options:

- **Display HEX/Verbose** toggles between the Hex/interpreted mode of displaying the SEL records.
- **Output Text/Binary** determines whether SEL data will be saved to the file (as under File - Save) in binary format or verbose format.

Help

The Help menu has the following option:

- **About** Displays the SEL Viewer version information.

Exiting the SSU

Exiting the SSU causes all windows to close.

1. Exit the SSU by opening the menu bar item File in the SSU Main window.
2. Click on Exit.
   or
   Highlight Exit, and press <Enter>.

Emergency Management Port Console

The Emergency Management Port (EMP) Console provides an interface to the Emergency Management Port (EMP) called the Console Manager. This interface allows remote server management via a modem or direct connection.

The following server control operations available with the Console Manager are:

- connecting to remote servers
- powering the server on or off
- resetting the server
- switching the server console between EMP active and BIOS re-direct modes

The Console Manager uses three management plug-ins to monitor the server:

- SEL viewer
- SDR viewer
- FRU viewer

The Console Manager also has a support plug-in Phonebook, which you can use to create and maintain a list of servers and their phone numbers. You can launch the Connect dialog directly from the Phonebook dialog to connect to a selected server.

How the EMP Console Works

The EMP shares use of the COM 2 port with the system. When the EMP has control of the port, the port operates in command state. When the system has control of it, the port operates in redirect state. When connecting to a server, the EMP Console checks to determine the current COM 2 port state. The following discussion covers how the EMP Console functions in each state:

- *Command state* is the default COM 2 state. In this state, the EMP Console communicates with the server's firmware, allowing the client to remotely reset or power the server up or down. The client can also view the server's System Event Log (SEL), Field Replaceable Unit (FRU) information, or Sensor Data Record (SDR) table.
- In *redirect state*, the EMP Console serves as a PC ANSI terminal window for BIOS console redirection. Commands typed in this terminal window are transmitted through BIOS to the server's console, and text displayed on the server console are displayed on the EMP Console's terminal window. With the EMP in this state, you can remotely view boot messages, access BIOS setup, and run DOS text mode applications through the EMP Console's terminal window.

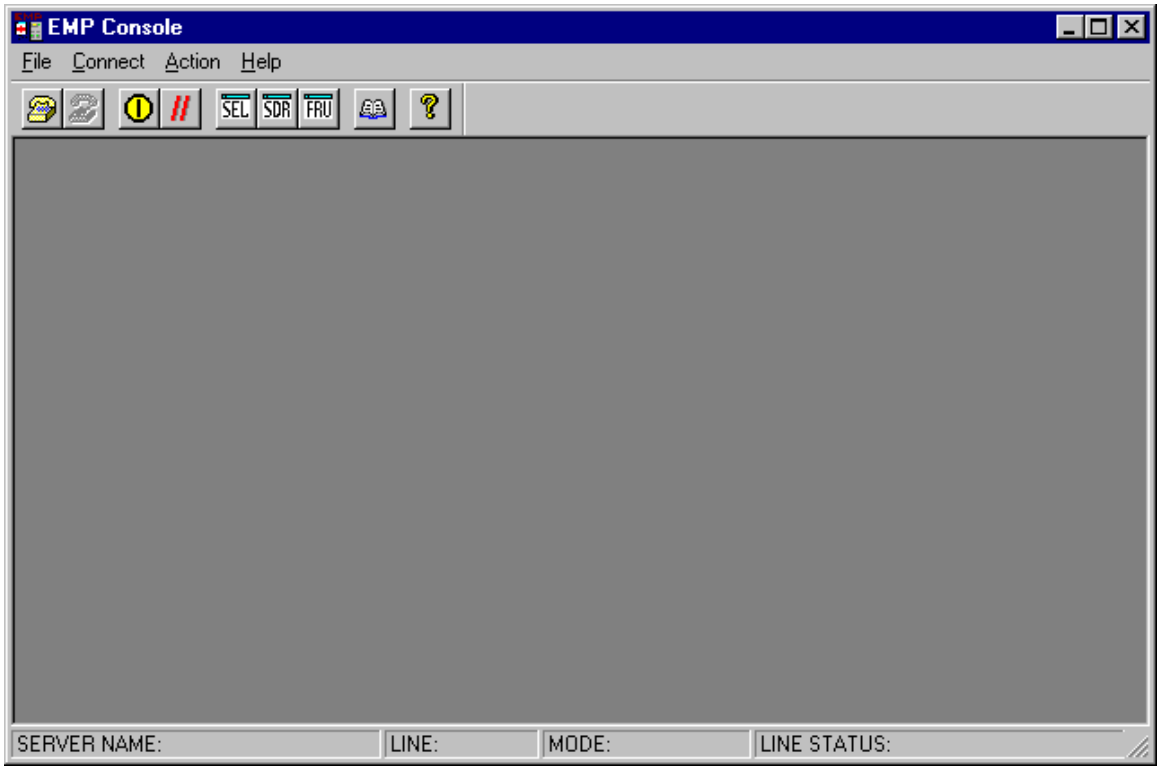

Figure 11. EMP Console in Command State

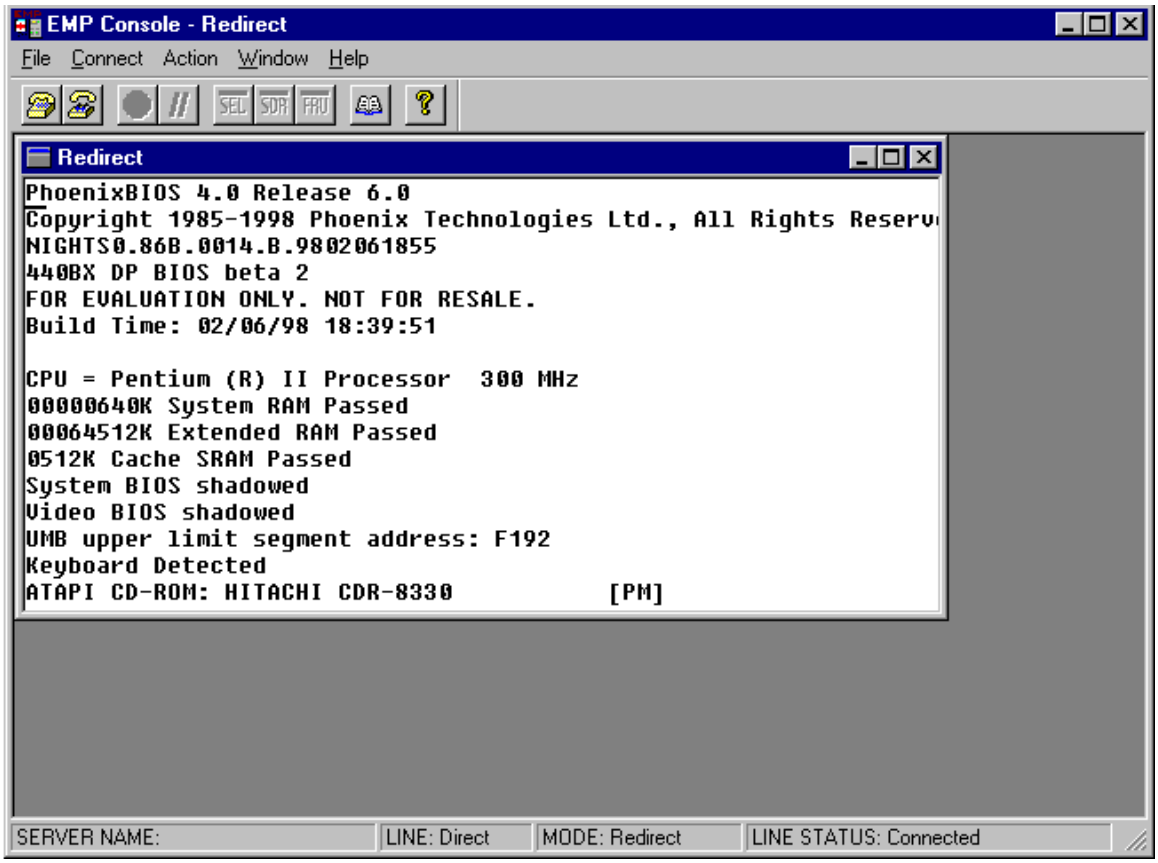

Figure 12. EMP Console in Redirect State

Figure 12 shows the EMP Console window in redirect state with the terminal window. The text that appears on the server monitor displays in the redirect window.

Availability of the various EMP Console features is determined by two things: the EMP access mode selected during configuration in the System Management Submenu of the BIOS Server Menu, and if the server's COM 2 port is configured for console redirect in BIOS. The three EMP access modes are disabled, pre-boot, and always active.

Table 7. EMP Console Access Modes (Server Configured for Console Redirect)

Mode	Server is powered off	During POST	After OS boots
Disabled	Redirect window appears, but is blank	Redirect window	Redirect window
Pre-boot	EMP commands available	Redirect window*	Redirect window
Always Active	EMP commands available	Redirect window*	EMP commands available

* The operation mode can be modified by selections in the post reset and post-power-up dialogs. These are server control dialogs available with the EMP Console.

Table 8. EMP Console Access Modes (Server not Configured for Console Redirect)

Mode	Server is powered off	During POST	After OS boots
Disabled	Redirect window appears, but is blank	Redirect window appears, but is blank	Redirect window appears, but is blank
Pre-boot	EMP commands available	EMP commands available	Redirect window appears, but is blank
Always Active	EMP commands available	EMP commands available	EMP commands available

Requirements

This section outlines the requirements and configurations necessary for using the EMP Console.

Operating Systems:

- Windows 95
  - 16 MB of RAM, 32 MB recommended
  - 20 MB disk space
- Windows NT†
  - Windows NT 4.0 or later
  - 24 MB of RAM, 32 MB recommended
  - 20 MB disk space

Client Configuration: The EMP Console will support all COM ports on the client system, along with any Windows NT/95 compatible modem.

Server Configuration: The EMP Console requires the server's COM 2 port to be connected to an external modem or directly connected to a serial cable.

Direct Connect Configuration: A null modem serial cable is needed. Connect one end of the cable into the COM 2 port of server and the other into a port on the client machine.

Modem Configuration: On the client, the EMP Console uses the Windows Application Program Interface (API) to determine if a modem is connected and available. The EMP Console does not configure the modem; it should be preconfigured through Windows.

For modem support, the server must use a Hayes compatible 14400 bps modem. The modem must be on the NT Hardware Compatibility List provided by Microsoft. The server modem must be set in auto-answer mode for the EMP Console to be able to connect to it.

Setting Up the Server for the EMP

To use the EMP, you must configure the server's BIOS with specific settings. These settings take place in two submenus of the BIOS Server menu, the System Management Submenu and the Console Redirect Submenu. The earlier BIOS settings section shows all available options. This section focuses on those settings that must be configured to use the EMP.

System Management Submenu

All EMP related settings occur from the System Management Submenu of the Server main menu. Change Only the items below; all other default settings should remain the same.

EMP Password: Anytime you attempt to initiate a connection, a prompt for the user password appears. If you never set up the EMP password, anyone can access the EMP by clicking OK through the password prompt.

In the EMP Password area of the System Management Submenu, type in a password of up to 8 alphanumeric characters. If a beep is heard, the password was not accepted and a different password must be entered.

EMP Access Modes: Choose either Disabled, Pre-boot, or Always Active, depending on the type of EMP access needed. The tables above show what is available with a given setting.

EMP Restricted Mode Access: Set Restricted Mode to either enabled or disabled as needed. If in enabled mode, this means that the EMP Console's server control options, Power On/Off and Reset, are unavailable. In disabled mode, these same server control options are available.

EMP Direct Connect/Modem Mode: Select Direct Connect if a null modem serial cable directly connects the server's COM 2 port to the EMP Console client machine. If they are connected via a modem, select Modem Mode.

Console Redirection Submenu

These settings in the Console Redirection Submenu of the Server menu must be set exactly as noted to be able to use the EMP.

COM Port Address: Select 2F8. This is the COM 2 port that must be used by the EMP. The IRQ# setting automatically populates with the correct number based on the COM Port Address choice.

Baud Rate: Select 19.2k.

Console Type: Choose PC ANSI.

Flow Control: Choose CTS/RTS + CD.

Main EMP Console Window

The main EMP Console window provides a graphical user interface (GUI) to access server control operations and to launch the management plug-ins from. At the top of the GUI is the menu and tool bar. These provide the options to initiate plug-ins and other support features. A status bar at the bottom displays connection information like server name, line status, and mode.

Toolbar

The tool bar buttons of the EMP Console main window combine server control and management plug-in options available from the Connect and Action menus as follows:


Generates the Connect dialog to allow connection to a selected server.


Disconnects from the server currently connected to.


Generates the Power On/Off dialog.


Generates the Reset dialog.

Launches the SEL viewer.

Launches the SDR viewer.

Launches the FRU viewer.


Opens the phonebook.


Opens the online help.

Status Bar

The status bar displays at the bottom of the current window. If contains the following status information:

- **SERVER NAME**: the name of the server connected to.
- **LINE**: the type of line connection. This would be either direct or modem.
- **MODE**: either Redirect of EMP, depending on whether the EMP has control of the COM 2 port.
- **LINE STATUS**: gives status information on the server connection. For example, if a server is connected, the status bar says "Connected." Otherwise, the line is blank.

EMP Console Main Menu

- **File**
  - **Exit** - Exits the EMP Console.
- **Connect**
  - **Disconnect** - disconnects the server connection.
  - **[Re]Connect** - raises the connect dialog.
  - A list of the five most recent connections - can click on one of the five servers most recently connected to. A connection to the selected server is initiated.
- **Action**
  - **Power On/Off** - powers the server on or off with post-power-up options.
  - **Reset** - resets the server with post-reset options.
  - **SEL Viewer** - opens the SEL viewer.
  - **SDR Viewer** - opens the SDR viewer.

- **FRU Viewer** - opens the FRU viewer.
- **Phonebook** - opens the phonebook dialog.

- **Help** - provides version information and help topics for the EMP Console.

Server Control Operations

Three server control operations are available from the menu or toolbar of the main EMP Console window, remote server connection, powering the server on and off, and resetting the server. The server console mode can also be switched between EMP active and BIOS redirect modes through post-power-up and reset options.

Connect

When you select [Re]Connect from the Connect menu, the Connect dialog in Figure 13 allows you to connect to a selected server. If the client machine is already connected to a server, initiating connection generates a warning message. It lets you know that the existing connection will be terminated if you continue trying to initiate the new connection. You are prompted to enter the EMP password whenever a connection is attempted.

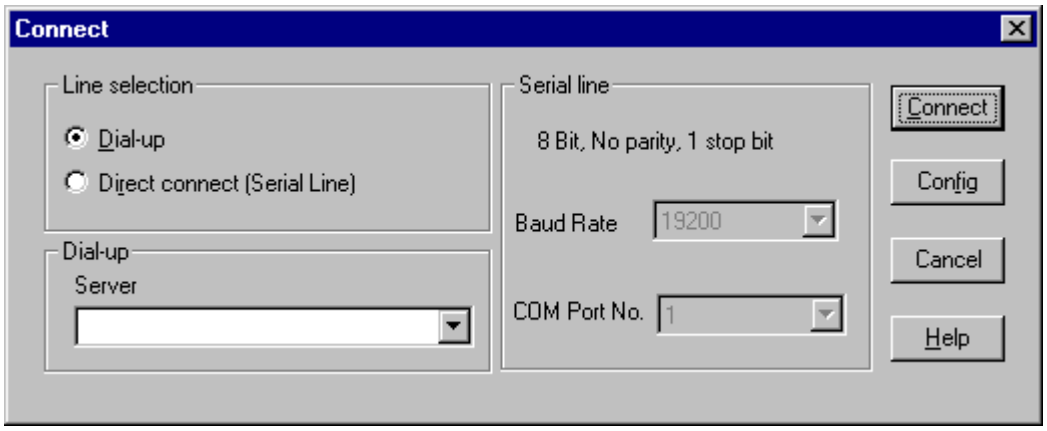

Figure 13. Connect Dialog

Options available in the dialog are:

- **Line Selection** - you can specify whether to use a direct connection or dial-up modem connection to the server.
  - **Dial-up** - connects to a selected server with a modem.
  - **Direct connect (Serial Line)** - connects to the selected server directly using a null modem serial cable.
- **Server** - you can select or enter a server name from a dropdown edit list box of available servers. A server must be selected when the line selection is Dial-up.
- **Serial Line** - must be filled out when the line selection is set to Direct connect (Serial Line).
  - **Baud Rate** - must be 19200 for EMP to connect properly.
  - **COM Port No.** - set the COM Port number to which the null modem serial cable is connected.

- **Connect** - initiates connection to the connected server. When this button is clicked, you are prompted for the EMP password.
- **Config** - displays the Phonebook dialog.
- **Cancel** - exits the Connect dialog without any action taken.
- **Help** - displays dialog level help information.

Power On/Off

Selecting Power On/Off from the Action menu allows you to power the server on or off, with post-power-up options. It generates the Power on/off dialog.

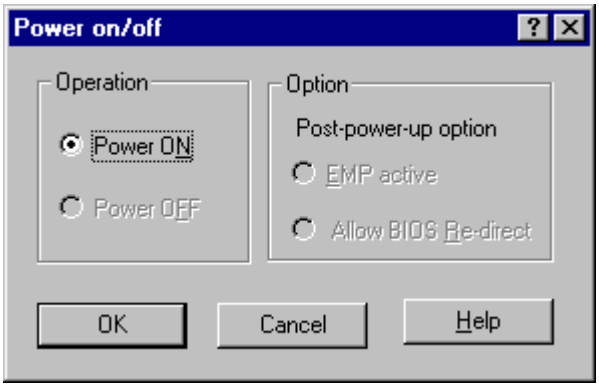

Figure 14. Power On/Off Dialog

Options available in the dialog are:

- **Power ON** - powers on the server.
- **Power OFF** - powers off the server. This option is not allowed if the server is configured in RESTRICTED mode for EMP operations.
- **Post-power-up option -** sets the mode selection of the server to EMP active or BIOS redirection. The setting is available after the next power-up. The default selection is EMP active.
- **Cancel** - exits the dialog without any action taken.
- **Help** - displays dialog level help information.

Reset

Selecting Reset from the Action menu generates the Reset dialog so that you can remotely reset the server with post-reset options.

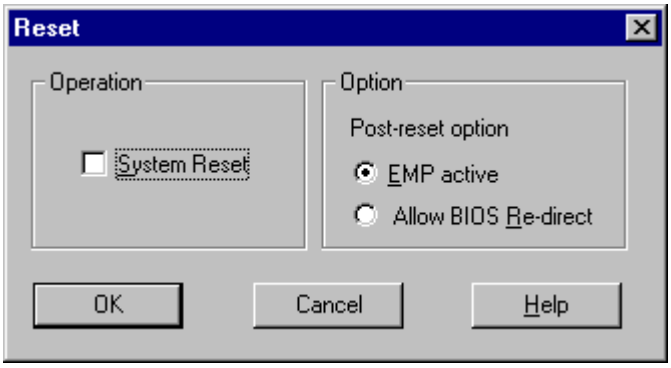

Figure 15. Reset Dialog

Options available in the dialog are:

- **System Reset** - resets the server with the selected post-reset options. This operation is not allowed if the server is configured in RESTRICTED mode for EMP operations.
- **Option Group** - sets the post-reset option that will be effective after reset. The options are EMP active or BIOS redirection. The default selection is EMP active.
- **Cancel** - exits the dialog without any action taken.
- **Help** - displays dialog level help information.

Phonebook

The EMP Console provides a support plug-in known as the Phonebook. The Phonebook stores names and numbers of servers in a list that can be updated by adding, modifying or deleting entries. The Phonebook can be opened from the main menu and tool bars, or launched from the Connect dialog by clicking the Config button.

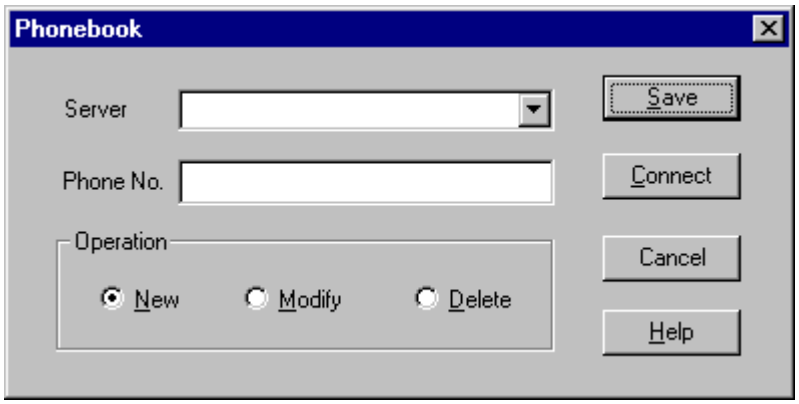

Figure 16. Phonebook Dialog

Options available in the dialog are:

- **Server** - a dropdown list of server names previously stored in the Phonebook. If the New radio button is selected in the Operation area, this area is cleared.
- **Phone No.** - the number of the selected server. If the New radio button is selected in the Operation area, this area is cleared.
- **Operation**
  - **New** - lets you make a new entry in the phonebook. Selecting this option clears the Server and Phone No. fields. You must click Save for the entry to be added to the phonebook.
  - **Modify** - lets you edit an existing entry. You select an existing entry from the Server dropdown edit box and modifies the existing phone number before selecting this option. Click Save in order to store this entry in the phonebook.
  - **Delete** - lets you delete an entry from the phonebook. You must first select an existing server from the Server dropdown edit box before selecting this option. You must click Save for the entry to be deleted.
- **Save** - saves a new or modified Phonebook entry or deletes an entry if the Delete radio button was selected.
- **Connect** - raises the Connect dialog with the server from the Phonebook's Server dropdown edit box already populating the Connect dialog's Server dropdown edit box.
- **Cancel** - exits the dialog without any action taken.
- **Help** - displays dialog level help information.

Management Plug-ins

SEL Viewer

The SEL viewer provides access to the System Event Log on the server and can display records in either hexadecimal or text (verbose) form. Options available through the SEL viewer are:

- View the SEL from a file
- Save the SEL to a file
- View SEL summary info
- View all SEL entries
- View SEL info by event type
- View SEL info by sensor type
- Set SEL display mode to either Hex or verbose mode
- Set the SEL output file format to either text or binary format
- Close the SEL viewer
- Exit the EMP Console

SEL Viewer Menu Options

The following menu options are found on the SEL viewer menu bar:

- **File**
  - **Open** - you can view SEL data from a previously saved file if it was stored in binary format. Selecting the Open menu item allows you to specify a filename under which the data is found. The default filename is "SELLOG.DAT." If the file cannot be opened, the program displays an error message.
  - **Close** - you can close the SEL viewer.
  - **Save As** - dumps the SEL data to a file in either binary raw or verbose text format. The binary file may be retrieved later. Selecting this option lets you specify a filename to which the data would be saved. The default filename is "SELLOG.DAT." If there is no data, an error message will be displayed.
  - **Exit** - exits the EMP Console.
- **Connect**
- **View**
  - **SEL Information** - displays SEL summary information as returned by the server.
  - **All Events** - displays all events in the SEL.
  - **By Sensor Type** - shows all events in the SEL generated by a specific sensor type such as voltage, temperature, etc.
  - **By Event** - displays all the events in the SEL of a particular type; for example, by memory or threshold. A pop-up menu lets you select the event type to display. This pop-up menu displays all the event types that may be generated by the particular hardware.
- **Settings** - you can change several operating parameters for the SEL viewer. This menu displays the following suboptions:
  - **Display HEX/Verbose** - toggles between HEX mode and interpreted mode of displaying SEL records.
  - **Output Text/Binary** - determines whether SEL data will be saved to the file in binary format or verbose format.

- **Window** - gives options for displaying currently open windows.
- **Help** - provides version information for the SEL viewer and provides help topics on the EMP Console.

SDR Viewer

The SDR viewer lets you view the Sensor Data Records retrieved from the SDR repository. Options available through the SDR viewer are:

- View all SDR records
- View SDR entries by SDR type
- View SDR summary info
- Set SDR display mode to either Hex or verbose mode
- Close the SDR viewer
- Exit the EMP Console

SDR Viewer Menu Options

The following menu options are found on the SDR viewer menu bar:

- **File**
  - **Close** - closes the SDR viewer.
  - **Exit** - exits the EMP Console.
- **View**
  - **Display all Records** - displays all records from the SDR repository.
  - **SDR Type** - displays the records of a particular SDR type. You select an SDR type from a pop-up menu that displays all the SDR types available for the given hardware.
  - **SDR Info** - displays the SDR summary information as returned by the server.
- **Settings** - lets you change operating parameters for the SDR viewer. This menu displays the following suboption:
  - **Display HEX/Verbose** - toggles between HEX mode and interpreted mode of displaying SDR records.
- **Window** - gives options for displaying currently open windows.
- **Help** - provides version information for the SDR viewer and provides help topics on the EMP Console.

FRU Viewer

The FRU viewer allows you to view the server's FRU (Field Replaceable Units) data from the server's baseboard FRU information area. Options available with the SDR viewer are:

- View all FRU records
- View FRU summary info
- Set FRU display mode to either Hex or verbose mode
- Close the FRU viewer
- Exit the EMP Console

FRU Viewer Menu Options

The following menu options are found on the FRU viewer menu bar:

- **File**
  - **Close** - closes the FRU viewer.
  - **Exit** - exits the EMP Console.
- **View**
  - **Display all Records** - displays all FRU data, which consists of chassis, board, and product information.
  - **FRU Info** - displays the FRU summary information as returned by the server.
- **Settings** - lets you change operating parameters for the FRU viewer. This menu displays the following suboption:
  - **Display HEX/Verbose** - toggles between HEX mode and interpreted mode of displaying FRU records.
- **Window** - gives options for displaying currently open windows.
- **Help** - provides version information for the FRU viewer and provides help topics on the EMP Console.

FRUSDR Load Utility

The Field Replacement Unit (FRU) and Sensor Data Record (SDR) Load Utility is a DOS based program used to update the server management subsystem's product level FRU, SDR, and the Desktop Management Interface (DMI) nonvolatile storage components (EEPROMs). The load utility

- discovers the product configuration based on instructions in a master configuration file
- displays the FRU information
- updates the nonvolatile storage device (EEPROM) associated with the Baseboard Management Controller (BMC) that holds the SDR and FRU area
- updates the DMI FRU area located in the BIOS nonvolatile storage device
- generically handles FRU devices that may not be associated with the BMC

When to Run the FRUSDR Load Utility

You should run the FRUSDR Load Utility each time you upgrade or replace the hardware in your server, excluding add-in boards, hard drives, and RAM. For example, if you replace an array of fans, you need to run the utility. It programs the sensors that need to be monitored for server management.

Because the utility must be reloaded to properly initialize the sensors after programming, turn the server off and remove the AC power cords from the server. Wait approximately 30 seconds, and reconnect the power cords.

What You Need to Do

The FRUSDR Load Utility may be run directly from the Configuration Software CD or from diskettes you create from the CD. Before you can run the FRUSDR Load Utility from a diskette, you must copy the utility from the Server Configuration Software CD to a DOS-bootable diskette.

If your diskette drive is disabled, or improperly configured, you must use BIOS Setup to enable it. If necessary, you can disable the drive after you are done with the FRUSDR utility.

How You Use the FRUSDR Load Utility

This utility is compatible with ROM-DOS Ver. 6.22, MS-DOS Ver. 6.22, and later versions. The utility accepts CFG, SDR and FRU load files. The executable file for the utility is frusdr.exe. The utility requires the following supporting files:

- one or more .fru files describing the system's field replaceable units
- a .cfg file describing the system configuration
- a .sdr file describing the sensors in the system

Command Line Format

The basic command line format is

```
frusdr [-?] [-h] [-d {dmi, fru, sdr}] [-cfg filename.cfg] -p -v
```

Command	Description
frusdr	Is the name of the utility.
-? or -h	Displays usage information.
-d {dmi, fru, sdr}	Only displays requested area.
-cfg filename.cfg	Uses custom CFG file.
-p	Pause between blocks of data.
-v	Verbose, display any additional details.

Parsing the Command Line

The FRUSDR Load Utility allows only one command line function at a time. A command line function may consist of two parameters; for example, -cfg filename.cfg. Any invalid parameters result in displaying an error message and exiting the program. You can use either a slash (/) or a minus sign (-) to specify command line options. The -p and -v flags may be used in conjunction with any of the other options.

Displaying Usage Information

When the utility is run with the -? or -h command line flags, the following message is displayed when the verbose flag -v is added to the help command:

```
FRU & SDR Load Utility Version 2.0 Revision R.2.1

Usage:   frusdr               Is the name of the utility.
         -? Or -h             Displays usage information.
         -d {dmi,fru,sdr}     Only displays requested area.
         -cfg filename.cfg    Uses custom CFG file.
         -p                   Pause between blocks of data.
         -v                   Verbose, display any additional details.


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This utility must be run from a system executing DOS. Running in a Window's
DOS box is insufficient and will provide incorrect results. Programming the
BMC FRU area clears the SDR table, therefore the SDR table must be
reprogrammed. Upon completing the programming of the FRU and SDR areas, the
server should be rebooted.

Note: DOS users may alternatively use a '/' instead of the '-'.
```

The following information is display if -v option is included in the command line.

```
The /D FRU command may be followed with up to 16 device addresses.  These
device addresses are used to view up to 16 different FRU areas, instead of
the default of displaying the BMC FRU. The arguments following the "-d FRU"
are in the same order and value as the NVS_TYPE, NVS_LUN, DEV_BUS and
DEV_ADDRESS which are found in the FRU file header in each FRU file. The
LUN address is optional.  If the LUN address is used, it must start with
an 'L'.

        Usage:    FRUSDR -d fru (device) [lun] (bus) (addr) (addr2) (etc)
        Example:  FRUSDR /D FRU IMBDEVICE L00 00 C0 C2

The configuration file may be used to load multiple FRU and SDR files.
In the configuration file, you may define which FRU and SDR areas are to
be programmed. Additionally, you may request information from the user
or ask the user to choose which areas to program.
```

Displaying a Given Area

When the utility is run with the -d DMI, -d FRU, or -d SDR command line flag, the indicated area is displayed. Each area represents a sensor; one sensor for each instrumented device in the server. If the given display function fails because of an inability to parse the data present or a hardware failure, the utility displays an error message and exits.

Displaying DMI Area

The DMI area is displayed in ASCII format when the field is ASCII or as a number when the field is a number. Each DMI area displayed is headed with the DMI area designated name. Each field has a field name header followed by the field in ASCII or as a number.

Example:

To display the DMI area, type **`frusdr -d dmi`** and press <Enter>. A message similar to the following appears:

```
Displaying DMI Area...

System Information (Type 1, 8 bytes)
               Manufacturer  = Intel
               Product   = NA440BX BP
               Version   = 000000000000
               Serial Number = 0123456789

Board Information (Type 2, 8 bytes)
               Manufacturer  = Intel
               Product   = N440BX Ultra SCSI Backplane
               Version   = 681234-501
               Serial Number = N03121530

Chassis Information (Type 3, 9 bytes)
               Manufacturer  = Intel
               Type   = Main Server Chassis
               Version   = 000000-000
               Serial Number = 9912345678
               Asset Tag#    =
```

Displaying FRU Area

The FRU area is displayed in ASCII format when the field is ASCII or as a number when the field is a number. Each FRU area displayed is headed with the FRU area designated name. Each field has a field name header followed by the field in ASCII or as a number. The Board, Chassis, and Product FRU areas end with an END OF FIELDS CODE that indicates there is no more data in this area. The Internal Use area is displayed in hex format, 16 bytes per line.

Example:

To display the FRU area, type **`frusdr -d fru`** and press <Enter>. A message similar to the following appears:

```
Common Header Area (Version 1, Length 8)
               Header Area Version    = 01h
               Internal Area Offset   = 01h
               Chassis Area Offset    = 0Ah
               Board Area Offset      = 0Eh
               Product Area Offset    = 16h
               PAD = 00h
               PAD = 00h
               CHECKSUM  = D0h

Internal Information Area (Version 0, Length 72)
               00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
               00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
               00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
               00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
               00 00 00 00 00 00 00 00

Chassis Information Area (Version 1, Length 32)
               Chassis Type  = 11h
               Part Number (ASCII)    = 000000-000
               Serial Number (ASCII)  = 9912345678
END OF FIELDS CODE

Board Information Area (Version 1, Length 64)
               Unicode Country Base          = 00h
               Manufacturing Time (mins)     = 733803
               Manufacturer Name (ASCII)     = Intel
               Product Name (ASCII)          = N440BX
               Serial Number (ASCII)         = 0123456789
               Part Number (ASCII)           = 000000-000
END OF FIELDS CODE

Product Information Area (Version 1, Length 80)
               Unicode Country Base          = 00h
               Manufacturer Name (ASCII)     = Intel
               Product Name (ASCII)          = N440BX DP
               Part Number (ASCII)           = 000000000000
               Version (ASCII)         =
               Serial Number (ASCII)         = 0123456789
               Asset Tag (ASCII)             =
END OF FIELDS CODE
```

Displaying SDR Area

The SDR nonvolatile storage area is displayed in the following hex format. The data is separated by a Sensor Record Number X header, where X is the number of that sensor record in the SDR area. The next line after the header is the sensor record data in hex format delineated by spaces. Each line holds up to 16 bytes. The data on each line is followed by the same data in ASCII format; nonprintable characters are substituted by a period (.).

Example:

To display the SDR area, type **`frusdr -d sdr`** and press <Enter>. A message similar to the following appears:

```
Reading SDR Record #1
               0E 00 10 01 37 20 00 0F 05 00 10 F1 F8 02 01 85 ....7.........
               02 00 00 00 04 00 00 C4 02 00 08 30 C2 07 91 95 ...........0....
               8E FF 00 1B 1B 00 99 95 00 8A 8E 02 02 00 01 CC ................
               53 43 53 49 2D 42 2D 54 65 72 6D 33      SCSI-B-Term3

Reading SDR Record #2
               0E 40 10 01 30 20 00 13 05 00 10 F1 F8 04 01 05 .@..0 .........
               00 00 00 20 29 00 00 1E 02 00 00 00 00 00 00 00  ... )...........
               00 FF 00 03 03 00 00 00 00 42 49 02 02 00 01 C5 .........BI.....
               46 41 4E 2D 32                    FAN-2
```

Using Specified CFG File

The utility can be run with the command line parameter of -cfg filename.cfg. The filename can be any DOS accepted, eight-character filename string. The utility loads the specified CFG file uses the entries in the configuration file to probe the hardware and to select the proper SDRs to load into nonvolatile storage.

Displaying Utility Title and Version

The utility displays its title:

```
FRU & SDR Load Utility, Version 2.0, Revision X.XX
```

Where X.XX is the revision number for the utility.

Configuration File

The configuration file is in ASCII text. The utility executes commands formed by the strings present in the configuration file. These commands cause the utility to perform various tasks needed to ultimately load the proper SDRs into the nonvolatile storage of the BMC and possibly generic FRU devices. Some of the commands may be interactive and require you to make a choice.

Prompting for Product Level FRU Information

Through the use of a Configuration File, the utility may prompt you for FRU information.

Filtering Sensor Data Record From the SDR File

The MASTER.SDR file has all the possible SDRs for the system. These records may need to be filtered based on the current product configuration. The configuration file directs the filtering of the SDRs.

Updating the SDR Nonvolatile Storage Area

After the utility validates the header area of the supplied SDR file, it updates the SDR repository area. Before programming, the utility clears the SDR repository area. If the SDR file is loaded via a .cfg File, the utility filters all tagged SDRs depending on the product configuration set in the Configuration File. Nontagged SDRs are automatically programmed. The utility also copies all written SDRs to the SDR.TMP file. It contains an image of what was loaded, and the TMP file is also useful for debugging the server.

Updating FRU Nonvolatile Storage Area

After the configuration is determined, the utility updates the FRU nonvolatile storage area. First it verifies the Common Header area and checksum from the specified FRU file. The Internal Use Area is read out of the specified .FRU file and is programmed into the nonvolatile storage. The Chassis Area is read out of the specified .FRU file. Last it reads the Product Area out of the specified FRU file, then the area is programmed into the FRU nonvolatile storage. All the areas are also written to the FRU.TMP file, which happens before the areas get programmed.

Updating DMI FRU Nonvolatile Storage Area

After programming the BMC FRU area, the utility then programs the following Chassis, Board, and Product FRU information to the DMI fields.

Example:

```
Loading DMI System Area
  Manufacturer Name : Intel
  Name : NA440BX Server System
  Version Number : SMADN000BN00
  Serial Number : 0123456789
Loading DMI Board Area
  Manufacturing Name : Intel
  Name : BMAD440LX
  Serial Number : 0123456789
  Version Number : 681234-501
Loading DMI Chassis Area
  Chassis Part Number : 000000-000
  Chassis Serial Number :
  Asset Tag :
```

If a failure occurs, the utility displays an error message and exits.

Cleaning Up and Exiting

If an update was successfully performed, the utility displays a single message and then exits.

If the utility fails, it immediately exits with an error message and exit code.

Upgrading the BIOS

Preparing for the Upgrade

Before you upgrade the BIOS, prepare for the upgrade by recording the current BIOS settings, obtaining the upgrade utility, and making a copy of the current BIOS.

Recording the Current BIOS Settings

1. Boot the computer and press <F2> when you see the message:

```
Press <F2> Key if you want to run SETUP
```

2. Write down the current settings in the BIOS Setup program.

NOTE

Do not skip step 2. You will need these settings to configure your computer at the end of the procedure.

Obtaining the Upgrade Utility

You can upgrade to a new version of the BIOS using the new BIOS files and the BIOS upgrade utility, iFLASH.EXE. You can obtain the BIOS upgrade file and the iFLASH.EXE utility through your computer supplier or from the Intel World Wide Web site:

http://www.intel.com.

NOTE

Please review the instructions distributed with the upgrade utility before attempting a BIOS upgrade.

This upgrade utility allows you to:

- Upgrade the BIOS in flash memory.
- Update the language section of the BIOS.

The following steps explain how to upgrade the BIOS.

Creating a Bootable Floppy Diskette

1. Use a DOS or Windows 95 system to create the floppy disk.
2. Insert a floppy disk in floppy drive A.
3. At the C:\ prompt, for an unformatted floppy disk, type:

```
format a:/s
```

or, for a formatted floppy disk, type:

```
sys a:
```

4. Press <Enter>

Creating the BIOS Upgrade Floppy Diskette

The BIOS upgrade file is a compressed self-extracting archive that contains the files you need to upgrade the BIOS.

1. Copy the BIOS upgrade file to a temporary directory on your hard disk.
2. From the C:\ prompt, change to the temporary directory.
3. To extract the file, type the name of the BIOS upgrade file, for example:

```
10006BI1.EXE
```

4. Press <Enter>. The extracted file contains the following files:

```
LICENSE.TXT

README.TXT

BIOS.EXE
```

5. Read the LICENSE.TXT file, which contains the software license agreement and the README.TXT file, which contains the instructions for the BIOS upgrade.
6. Insert the bootable floppy disk into drive A.
7. To extract the BIOS.EXE file to the floppy disk, change to the temporary directory that holds the BIOS.EXE file and type:

```
BIOS A:
```

8. Press <Enter>.
9. The floppy disk now holds the BIOS upgrade and recovery files.

Upgrading the BIOS

1. Boot the computer with the floppy disk in drive A. The BIOS upgrade utility screen appears.
2. Select Update Flash Memory From a File.
3. Select Update System BIOS. Press <Enter>.
4. Use the arrow keys to select the correct .bio file. Press <Enter>.
5. When the utility asks for confirmation that you want to flash the new BIOS into memory, select Continue with Programming. Press <Enter>.
6. When the utility displays the message upgrade is complete, remove the floppy disk. Press <Enter>.
7. As the computer boots, check the BIOS identifier (version number) to make sure the upgrade was successful.
8. To enter the Setup program, press <F2> when you see the message:

```
Press <F2> Key if you want to run SETUP
```

9. For proper operation, load the Setup program defaults. To load the defaults, press <F9>.
10. To accept the defaults, press <Enter>.
11. Set the options in the Setup program to the settings you wrote down before the BIOS upgrade.
12. To save the settings, press <F10>.
13. To accept the settings, press <Enter>.
14. Turn off the computer and reboot.

Recovering the BIOS

It is unlikely that anything will interrupt the BIOS upgrade; however, if an interruption occurs, the BIOS could be damaged. The following steps explain how to recover the BIOS if an upgrade fails. The following procedure use recovery mode for the Setup program. for more information about Setup modes.

NOTE

Because of the small amount of code available in the non-erasable boot block area, there is no video support. You will not see anything on the screen during the procedure. Monitor the procedure by listening to the speaker and looking at the floppy drive LED.

1. Turn off all peripheral devices connected to the computer. Turn off the computer.
2. Remove the computer cover.
3. Locate jumper block J3J2.
4. Move the Recovery Boot jumper from pins 9-10 to pins 10-11 (see Figure 18 on page 108).
5. Insert the bootable BIOS upgrade floppy disk into floppy drive A.
6. Replace the cover, turn on the computer, and allow it to boot. The recovery process will take a few minutes.
7. Listen to the speaker.
8. Two beeps and the end of activity in drive A indicate successful BIOS recovery.
9. A series of continuous beeps indicates failed BIOS recovery.
10. If recovery fails, return to step 1 and repeat the recovery process.
11. If recovery is successful, turn off the computer. Remove the computer cover and continue with the following steps.
12. Move the Recovery Boot jumper back to pins 9-10.
13. Replace the computer cover. Leave the upgrade disk in drive A and turn on the computer.
14. Continue with the BIOS upgrade (see page 76).

Changing the BIOS Language

You can use the BIOS upgrade utility to change the language the BIOS uses for messages and the Setup program. Use a bootable floppy disk containing the Intel flash utility and language files (see page 76).

1. Boot the computer with the bootable floppy disk in drive A. The BIOS upgrade utility screen appears.
2. Select `Update Flash Memory From a File`.
3. Select `Update Language Set`. Press `<Enter>`.
4. Select drive A and use the arrow keys to select the correct `.lng` file. Press `<Enter>`.
5. When the utility asks for confirmation that you want to flash the new language into memory, select `Continue with Programming`. Press `<Enter>`.
6. When the utility displays the message `upgrade is complete`, remove the floppy disk. Press `<Enter>`.
7. The computer will reboot and the changes will take effect.

Using the Firmware Update Utility

The Firmware Update Utility is a DOS based program used to update the Baseboard Management Controller's firmware code. You only need to run the Firmware Update Utility if new firmware code becomes necessary.

Running the Firmware Update Utility

1. Create a DOS bootable diskette. The version of DOS must be 6.0 or higher.
2. Place the firmware update utility (FWUPDATE.EXE) and the *.hex file on the diskette. Make a note of the *.hex file name, you will need it later.
3. Insert the diskette into the drive and boot to it.
4. At the DOS prompt, run the executable file (FWUPDATE.EXE).
5. The utility will display a menu screen. Select "Upload Flash."
6. The utility will ask for a file name. Enter the name of the *.hex file.
7. The program will load the file and then ask if it should "Upload Boot Block." Press "N" to continue.
8. The program will next ask if it should "Upload Operational Code." Press "Y" to continue.
9. Once the operational code has been updated and verified, press any key to continue. Then press the "ESC" key to exit the program.
10. Shut the system down and remove any floppy disks that may be in the system.
11. Disconnect the AC power cord from the system and wait 60 seconds.
12. Connect the AC power cord and power up the system.

Installing Video Drivers

After configuring the system, you need to install video drivers to take full advantage of the features of the onboard Cirrus Logic CL-GD5480 super VGA video controller.

- The Configuration Software CD includes video drivers for use with DOS and Windows NT. Check the README.TXT file on the CD for information on installing these drivers.
- For other operating systems, see your OS instructions for installing device drivers.

Using the Symbios SCSI Utility

The Symbios SCSI utility detects the SCSI host adapters on the system board. Use the utility to

- change default values
- check and/or change SCSI device settings that may conflict with those of other devices in the server

Running the SCSI Utility

1. When this message appears on the video monitor:

```
Press Ctrl-C to run SCSI Utility...
```

2. Press <Ctrl+C> to run this utility. When it appears, choose the host adapter that you want to configure.

4 Solving Problems

This chapter helps you identify and solve problems that might occur while you are using the system.

Resetting the System

To do this:	Press:
Soft boot reset, which clears system memory and reloads the operating system.	<Ctrl+Alt+Del>
Clear system memory, restart POST, and reload the operating system.	Reset button
Cold boot reset. Turn the system power off and then on. This clears system memory, restarts POST, reloads the operating system, and halts power to all peripherals.	Power off/on

Fault Resilient Booting

Fault resilient booting insures the system will not stop from a boot problem. Two sets of timers are implemented in the BMC that will automatically reset the system if the system should halt for some reason.

- FRB 2 - 5 sec timer. If the primary processor does not come up in 5 seconds the system will automatically reset and switch to the secondary processor (if installed. It will try to boot off the primary if not.)
- FRB 3 - 7 minute timer. If the system does not make it up to the end of POST in 7 minutes, the system will automatically reset and try again. It is assumed that the processor failed regardless of what may have caused the system to hang. The primary processor is taken off line and the system will boot off the secondary (if installed otherwise it will try to boot again off of the primary.) Bad memory or a bad plug in card may cause an FRB 3 failure.

All failures are logged to the system event log.

The system will remember all FRB errors and display them at the end of POST until you select the Processor Retest option from the BIOS Setup utility.

Initial System Startup

Problems that occur at initial system startup are usually caused by incorrect installation or configuration. Hardware failure is a less frequent cause.

Checklist

- ❑ Are all cables correctly connected and secured?
- ❑ Are the processors fully seated in their slots on the system board?
- ❑ Are all add-in ISA and PCI boards fully seated in their slots on the system board?
- ❑ Are all switch and jumper settings on the system board correct?
- ❑ Are all jumper and switch settings on add-in boards and peripheral devices correct? To check these settings, refer to the manufacturer's documentation that comes with them. If applicable, ensure that there are no conflicts—for example, two add-in boards sharing the same interrupt.
- ❑ Are all SDRAM DIMMs installed correctly?
- ❑ Are all peripheral devices installed correctly?
- ❑ If the system has a hard disk drive, is it properly formatted or configured?
- ❑ Are all device drivers properly installed?
- ❑ Are the configuration settings made with the SSU correct?
- ❑ Is the operating system properly loaded? Refer to the operating system documentation.
- ❑ Did you press the system power on/off switch on the front panel to turn the server on (power-on light should be lit)?
- ❑ Is the system power cord properly connected to the system and plugged into a NEMA 5-15R outlet for 100-120 V~ or a NEMA 6-15R outlet for 200-240 V~?
- ❑ Is AC power available at the wall outlet?

If these items are correct but the problem recurs, see "More Problem-solving Procedures" on page 81.

Running New Application Software

Problems that occur when you run new application software are usually related to the software. Faulty equipment is much less likely, especially if other software runs correctly.

Checklist

- ❑ Does the system meet the minimum hardware requirements for the software? See the software documentation.
- ❑ Is the software an authorized copy? If not, get one; unauthorized copies often do not work.
- ❑ If you are running the software from a diskette, is it a good copy?
- ❑ If you are running the software from a CD-ROM disk, is the disk scratched or dirty?
- ❑ If you are running the software from a hard disk drive, is the software correctly installed? Were all necessary procedures followed and files installed?
- ❑ Are the correct device drivers installed?
- ❑ Is the software correctly configured for the system?
- ❑ Are you using the software correctly?

If the problems persist, contact the software vendor's customer service representative.

After the System Has Been Running Correctly

Problems that occur after the system hardware and software have been running correctly often indicate equipment failure. Many situations that are easy to correct, however, can also cause such problems.

Checklist

- ❑ If you are running the software from a diskette, try a new copy of the software.
- ❑ If you are running the software from a CD-ROM disk, try a different disk to see if the problem occurs on all discs.
- ❑ If you are running the software from a hard disk drive, try running it from a diskette. If the software runs correctly, there may be a problem with the copy on the hard disk drive. Reinstall the software on the hard disk, and try running it again. Make sure all necessary files are installed.
- ❑ If the problems are intermittent, there may be a loose cable, dirt in the keyboard (if keyboard input is incorrect), a marginal power supply, or other random component failures.
- ❑ If you suspect that a transient voltage spike, power outage, or brownout might have occurred, reload the software and try running it again. (Symptoms of voltage spikes include a flickering video display, unexpected system reboots, and the system not responding to user commands.)

NOTE

Random errors in data files: if you are getting random errors in your data files, they may be getting corrupted by voltage spikes on your power line. If you are experiencing any of the above symptoms that might indicate voltage spikes on the power line, you may want to install a surge suppressor between the power outlet and the system power cord.

More Problem-solving Procedures

This section provides a more detailed approach to identifying a problem and locating its source.

Preparing the System for Diagnostic Testing

CAUTION

Turn off devices before disconnecting cables: before disconnecting any peripheral cables from the system, turn off the system and any external peripheral devices. Failure to do so can cause permanent damage to the system and/or the peripheral devices.

1. Turn off the system and all external peripheral devices. Disconnect all of them from the system, except the keyboard and video monitor.
2. Make sure the system power cord is plugged into a properly grounded AC outlet.

3. Make sure your video display monitor and keyboard are correctly connected to the system. Turn on the video monitor. Set its brightness and contrast controls to at least two-thirds of their maximum ranges (see the documentation supplied with your video display monitor).
4. If the operating system normally loads from the hard disk drive, make sure there is no diskette in drive A. Otherwise, place a diskette containing the operating system files in drive A.
5. Turn on the system. If the power LED does not light, see “Power Light Does Not Light” on page 83.

Using PCDiagnostics

A diagnostics package for the system is contained on the Configuration Software CD that comes with the system. For documentation about the test modules, see the Diagnostic help disks that end with the extension .HLP. They are ASCII files that you can print to form a manual of all tests in this product.

- The program called Testview uses a simple DOS-based menu system.
- The program called T.EXE is not for Windows or DOS; you can access it at the command line prompt without having a hard drive installed.

The README.TXT file for diagnostics tells how to install the program.

⚠ **CAUTION**

Read help information for a test before running it: the diagnostic package contains many optional tests that should only be used by a user with advanced technical knowledge. Inadvertent actions could be damaging, such as running a hard drive write test on a hard disk. All tests that require external hardware, user interaction, or are destructive are disabled in the default configurations. Before using such a test, make sure you read and understand the help information for that test.

Monitoring POST

See Chapter 3.

Verifying Proper Operation of Key System Lights

As POST determines the system configuration, it tests for the presence of each mass storage device installed in the system. As each device is checked, its activity light should turn on briefly. Check for the following:

- ❑ Does the diskette drive activity light turn on briefly? If not, see “Diskette Drive Activity Light Does Not Light” on page 85.
- ❑ If a second diskette drive is installed, does its activity light turn on briefly? If not, see “Diskette Drive Activity Light Does Not Light” on page 85.
- ❑ If there is a hard disk drive or SCSI devices installed in the system, does the hard disk drive activity light on the control panel turn on briefly? If not, see “Hard Disk Drive Activity Light Does Not Light" on page 85.

Confirming Loading of the Operating System

Once the system boots up, the operating system prompt appears on the screen. The prompt varies according to the operating system. If the operating system prompt does not appear, see "Initial System Startup" on page 79.

Specific Problems and Corrective Actions

This section provides possible solutions for these specific problems:

- Power light does not light.
- No beep or incorrect beep pattern.
- No characters appear on screen.
- Characters on the screen appear distorted or incorrect.
- System cooling fans do not rotate.
- Diskette drive activity light does not light.
- Hard disk drive activity light does not light.
- CD-ROM drive activity light does not light.
- Problems with application software.
- The bootable CD-ROM is not detected.

Try the solutions in the order given. If you cannot correct the problem, contact your service representative or authorized dealer for assistance.

Power Light Does Not Light

Check the following:

- ❑ Is the system operating normally? If so, the power LED is probably defective or the cable from the front panel to the system board is loose.
- ❑ Are there other problems with the system? If so, check the items listed under "System Cooling Fans Do Not Rotate Properly."

If all items are correct and problems persist, contact your service representative or authorized dealer for assistance.

No Characters Appear on Screen

Check the following:

- ❑ Is the keyboard working? Check to see that the "Num Lock" light is functioning.
- ❑ Is the video monitor plugged in and turned on?
- ❑ Are the brightness and contrast controls on the video monitor properly adjusted?
- ❑ Are the video monitor switch settings correct?
- ❑ Is the video monitor signal cable properly installed?

Is the onboard video controller enabled?

If you are using an add-in video controller board, do the following:

1. Verify that the video controller board is fully seated in the system board connector.
2. Reboot the system for changes to take effect.
3. If there are still no characters on the screen after you reboot the system and POST emits a beep code, write down the beep code you hear. This information is useful for your service representative. See "POST Codes and Countdown Codes" on page 88.
4. If you do not receive a beep code and characters do not appear, the video display monitor or video controller may have failed. Contact your service representative or authorized dealer for assistance.

Characters Are Distorted or Incorrect

Check the following:

- ❑ Are the brightness and contrast controls properly adjusted on the video monitor? See the manufacturer's documentation.
- ❑ Are the video monitor signal and power cables properly installed?

If the problem persists, the video monitor may be faulty or it may be the incorrect type. Contact your service representative or authorized dealer for assistance.

System Cooling Fans Do Not Rotate Properly

If the system cooling fans are not operating properly, system components could be damaged.

Check the following:

- ❑ Is AC power available at the wall outlet?
- ❑ Is the system power cord properly connected to the system and the wall outlet?
- ❑ Did you press the power button?
- ❑ Is the power-on light lit?
- ❑ Have any of the fan motors stopped (use the server management subsystem to check the fan status)?
- ❑ Are the fan power connectors properly connected to the system board?
- ❑ Is the cable from the front panel board connected to the system board?
- ❑ Are the power supply cables properly connected to the system board?
- ❑ Are there any shorted wires caused by pinched cables or power connector plugs forced into power connector sockets the wrong way?

If the switches and connections are correct and AC power is available at the wall outlet, contact your service representative or authorized dealer for assistance.

Diskette Drive Activity Light Does Not Light

Check the following:

- ❑ Are the diskette drive power and signal cables properly installed?
- ❑ Are all relevant switches and jumpers on the diskette drive set correctly?
- ❑ Is the diskette drive properly configured?
- ❑ Is the diskette drive activity light always on? If so, the signal cable may be plugged in incorrectly.

If you are using the onboard diskette controller, use the SSU to make sure that "Onboard Floppy" is set to "Enabled." If you are using an add-in diskette controller, make sure that "Onboard Floppy" is set to "Disabled." To run the SSU, see Chapter 3.

If the problem persists, there may be a problem with the diskette drive, system board, or drive signal cable. Contact your service representative or authorized dealer for assistance.

Hard Disk Drive Activity Light Does Not Light

If you have installed one or more hard disk drives in your system, check the following:

- ❑ Are the power and signal cables to the drive properly installed?
- ❑ Are all relevant switches and jumpers on the hard drive and adapter board set correctly?
- ❑ Is the onboard IDE controller enabled? (IDE hard drives only)
- ❑ Is the hard disk drive properly configured?

NOTE

Front panel hard disk LED indicates IDE and SCSI devices: the hard disk drive activity light on the front panel lights when either an IDE hard disk drive, or a SCSI device controlled by the onboard SCSI host controller, is in use. This LED does not display CD-ROM activity.

CD-ROM Drive Activity Light Does Not Light

Check the following:

- ❑ Are the power and signal cables to the CD-ROM drive properly installed?
- ❑ Are all relevant switches and jumpers on the drive set correctly?
- ❑ Is the drive properly configured?
- ❑ Is the onboard IDE controller enabled?

NOTE

Front panel hard disk LED indicates IDE and SCSI devices: the hard disk drive activity light on the front panel lights when either an IDE hard disk drive, or a SCSI device controlled by the onboard SCSI host controller, is in use. This LED does not display CD-ROM activity.

Cannot Connect to a Server

- ❑ Make sure you are using the drivers that are shipped on the system Configuration Software CD for the onboard network controller.
- ❑ Make sure the driver is loaded and the protocols are bound.
- ❑ Make sure the network cable is securely attached to the connector at the system back panel and that the network controller Link LED is on (visible at back panel). If the cable is attached but the problem persists, try a different cable.
- ❑ Make sure the hub port is configured for the same duplex mode as the network controller.
- ❑ Check with your LAN administrator about the correct networking software that needs to be installed.
- ❑ If you are directly connecting two servers (no hub), some hubs may also require a crossover cable (see your hub documentation for more information on crossover cables).
- ❑ Check the network controller LEDs that are visible through an opening at the system back panel.

Problems with Network

The server hangs when the drivers are loaded.

- ❑ Change the PCI BIOS interrupt settings. Try the "PCI Installation Tips" below.

Diagnostics pass, but the connection fails.

- ❑ Make sure the network cable is securely attached.
- ❑ Make sure you specify the correct frame type in your NET.CFG file.

The Link LED doesn't light.

- ❑ Make sure you have loaded the network drivers.
- ❑ Check all cable connections.
- ❑ Try another port on the hub.
- ❑ Make sure you have the correct type of cable between the adapter and the hub. Some hubs require a crossover cable while others require a straight-through cable (for more information on crossover cabling, see your hub documentation).

The Activity LED doesn't light.

- ❑ Make sure you've loaded the correct network drivers.
- ❑ Network may be idle. Try accessing a server.

The controller stopped working when an add-in adapter was installed.

- ❑ Make sure the cable is connected to the port from the onboard network controller.
- ❑ Make sure your PCI BIOS is current. Try the "PCI Installation Tips" below.
- ❑ Make sure the other adapter supports shared interrupts. Also, make sure your operating system supports shared interrupts; OS/2 does not.
- ❑ Try reseating the add in adapter.

The add-in adapter stopped working without apparent cause.

- ❑ Try reseating the adapter first; then try a different slot if necessary.
- ❑ The network driver files may be corrupt or deleted. Delete and then reinstall the drivers.
- ❑ Run the diagnostics.

PCI Installation Tips

Some common PCI tips are listed here.

- ❑ Reserve interrupts (IRQs) and/or memory addresses specifically for ISA adapters. This prevents PCI cards from trying to use the same settings ISA cards are using. Use the SSU to keep track of ISA adapter resources.
- ❑ Certain drivers may require interrupts that are not shared with other PCI drivers. The SSU can be used to adjust the interrupt numbers for PCI devices. For certain drivers, it may be necessary to alter settings so that interrupts are not shared.

Problems with Application Software

If you have problems with application software, do the following:

- ❑ Verify that the software is properly configured for the system. See the software installation and operation documentation for instructions on setting up and using the software.
- ❑ Try a different copy of the software to see if the problem is with the copy you are using.
- ❑ Make sure all cables are installed correctly.
- ❑ Verify that the system board jumpers are set correctly. See Chapter 5.
- ❑ If other software runs correctly on the system, contact your vendor about the failing software.

If the problem persists, contact the software vendor's customer service representative for assistance.

Bootable CD-ROM Is Not Detected

Check the following:

- ❑ Is the BIOS set to allow the CD-ROM to be the first bootable device?

Error and Informational Messages

When you turn on the system, POST displays messages that provide information about the system. If a failure occurs, POST emits beep codes that indicate errors in hardware, software, or firmware. If POST can display a message on the video display screen, it causes the speaker to beep twice as the message appears.

POST Codes and Countdown Codes

The BIOS indicates the current testing phase during POST after the video adapter has been successfully initialized by outputting a 2-digit hex code to I/O location 80h. If a port-80h ISA POST card is installed, it displays the 2-digit code on a pair of hex display LEDs.

Table 9. Port-80 Codes

Normal Port 80 Codes	Beeps	Error
02		Verify Real Mode
12		Restore processor control word during warm boot (only occurs on warm reboot)
24		Set ES segment register to 4GB
04		Get processor type
06		Initialize system hardware
18		8254 timer initialization
08		Initialize PCIset registers with initial POST values
C4		Initialize system flags in CMOS
11		Load alternate registers with initial POST values
0E		Initialize I/O
0C		Initialize caches to initial POST values
16	1-2-2-3	BIOS ROM checksum
17		Turn cache off
28		Autosize DRAM
2A		Clear 512K base RAM
2C	1-3-4-1	RAM failure on address line xxxx*
2E	1-3-4-3	RAM failure on data bits xxxx* of low byte of memory bus (1st 4 meg)
2F		Initialize L2 cache if enabled in CMOS
38		Shadow system BIOS ROM
20	1-3-1-1	Test DRAM refresh

continued

Table 9. Port-80 Codes (continued)

Normal Port 80 Codes	Beeps	Error
29		Post Memory Manager Initialization (PMM)
33		Post Dispatch manager Initialization
34		Test CMOS
C1		Post error manager Initialization
09		Set in POST flag
0A		Initialize processor registers and CPU microcode
3A		Autosize cache
0B		Enable processor cache
0F		Initialize the local bus IDE (not used anymore but here for phx std)
10		Initialize Power Management (APM not used in Nightshade)
14		Initialize keyboard controller
1A		8237 DMA controller initialization
1C		Reset Programmable Interrupt Controller
22	1-3-1-3	Test 8742 Keyboard Controller
32		Read processor bus-clock frequency and compute boot processor speed
67		Initialize and register other CPU via SMM through APIC bus
69		Initialize SMI handler for all processors
00		Wait for secondary processor to execute INIT SMI handler
F4		Exit SMI handler (secondary processor executed halt in sm.)
3C		Configure advanced PCIset registers and reset coprocessor
3D		Load alternate registers with CMOS values
42		Initialize interrupt vectors
46	2-1-2-3	Check ROM copyright notice
45		Initialize all pre-PnP devices
49		Initialize PCI bus and devices (also read ESCD and allocate resources)
48		Check video configuration against CMOS (VGA or MDA)
4A		Initialize all video adapters in system
4C		Shadow video BIOS ROM
24		Put CPU in big real mode (flat mode memory addressing - up to 4 GB)
59		Post display manager initialization (video screen error codes now visible)
22		Reset and test keyboard first try (only warm reset)
52		Reset and test keyboard controller (both warm and cold reset)
54		Set key click if enabled
76		Enable keyboard
58	2-2-3-1	Test for unexpected interrupts
4B		Quietboot start (not used in N440BX)
4E		Display copyright notice
50		Display CPU(s) type and speed

continued

Table 9. Port-80 Codes (continued)

Normal Port 80 Codes	Beeps	Error
51		EISA INIT (Not used in N440BX)
5A		Display prompt “Press F2 to enter SETUP”
5B		Disable CPU L1 cache for memory test
5C		Test RAM between 512 and 640k
60		Test extended memory (4Mb to top of memory)
62		Test extended memory address lines
64		Jump to UserPatch1
66		Configure advanced cache registers
68		Enable external and processor caches
6A		Display external cache size
6C		Display shadow message
6E		Display non-disposable segments
70		Display error messages to video
72		Check for configuration errors
74		Test real-time clock
7C		Set up hardware interrupt vectors
7E		Test coprocessor if present
80		Not used
88		Initialize BIOS Data Area, timeouts for detecting parallel, serial and hdd controller Clear CMOS shutdown flag
8A		Initialize Extended BIOS Data Area
81		Late post core initialization of devices
87		Configure MCD devices
85		Initialize and detect PC-compatible PnP ISA devices (serial, parallel etc)
82		Not used
84		Clear interrupts from com port detection
86		Console redirection initialized
83		Configure onboard hard disk controller
89		Enable NMI
8C		Initialize floppy controller
90		Initialize and detect hard disks
8B		Detect and test for Mouse or Auxiliary device on keyboard controller
95		Install CD-ROM for boot
92		Jump to UserPatch2
C5		Initialize GPNV areas of DMI
98	1-2	Search for option ROMs. One long, two short beeps on checksum failure of an option ROM

continued

Table 9. Port-80 Codes (continued)

Normal Port 80 Codes	Beeps	Error
93		Scan for User flash ROMs MP table initialization (wake up secondary processor and halt it)
9C		Set up Power Management (not used)
9D		Enable security
9E		Enable hardware interrupts
A0		Set time of day
A2		Check key lock
A4		Initialize typematic rate
C2		Initialize DMI tables
C3		Log post errors with Post error manager and to SEL in BMC Also update VID bits and memory presence to BMC Display and FRB errors (watchdog timeouts, BIST or CPU failures)
A8		Erase F2 prompt
AA		Scan for F2 key stroke
AC		Initialize EMP port if selected. Remove com2 from BDA if EMP is enabled Enter SETUP
AE		Clear in-POST flag
B0		Turn on secure boot if enabled (secure front panel, blank video, floppy write protect) Check for errors
B2		POST done – prepare to boot Operating System
B4	1	One short beep before boot
B5		Display Quietboot (not used)
BE		Clear screen
B6		Check password (optional)
BC		Clear parity checkers
BA		Not used
B7		ACPI configuration (table configuration in memory and BDA)
BD		Display multiboot menu if esc is hit
BF		Display system config summary(if enabled in CMOS)
8F		Get total # of hard drives and put in BDA
91		Program IDE hard drives (timing, PIO modes etc)
9F		Save Total # of hard drives (SCSI and ATA) in BDA
97		Fixup MP table (checksum)
99		Check smart hard drive

continued

Table 9. Port-80 Codes (continued)

Normal Port 80 Codes	Beeps	Error
C7		Prepare to boot to OS, clean up graphics and PMM areas.
C0		Try to boot with INT 19 return to video mode 3 disable PMM return to real mode disable gate A20 clears system memory reset stack Invokes INT 19 Error handling POST codes (may occur at anytime during post)
DO		Interrupt handler error
D2		Unknown interrupt error
D4		Pending interrupt error
D6		Initialize option ROM error
D8		Shutdown error
DA		Extended Block Move
DC		Shutdown 10 error

POST Error Codes and Messages

The following error codes and messages are representative of various conditions BIOS identifies. The exact strings and error numbers may be different from those listed here.

Table 10. POST Error Codes and Messages

Code	Error message
0162	BIOS unable to apply BIOS update to processor 1
0163	BIOS unable to apply BIOS update to processor 2
0164	BIOS does not support current stepping for processor 1
0165	BIOS does not support current stepping for processor 2
0200	Failure Fixed Disk
0210	Stuck Key
0211	Keyboard error
0212	Keyboard Controller Failed
0213	Keyboard locked - Unlock key switch
0220	Monitor type does not match CMOS - Run SETUP
0230	System RAM Failed at offset
0231	Shadow RAM Failed at offset
0232	Extended RAM Failed at offset
0250	System battery is dead - Replace and run SETUP
0251	System CMOS checksum bad - Default configuration used

continued

Table 10. POST Error Codes and Messages (continued)

Code	Error message
0260	System timer error
0270	Real time clock error
0297	ECC Memory error in base (extended) memory test in Bank xx
02B2	Incorrect Drive A type - run SETUP
02B3	Incorrect Drive B type - run SETUP
02D0	System cache error - Cache disabled
02F5	DMA Test Failed
02F6	Software NMI Failed
0401	Invalid System Configuration Data - run configuration utility
None	System Configuration Data Read Error
0403	Resource Conflict
0404	Resource Conflict
0405	Expansion ROM not initialized
0406	Warning: IRQ not configured
0504	Resource Conflict
0505	Expansion ROM not initialized
0506	Warning: IRQ not configured
0601	Device configuration changed
0602	Configuration error - device disabled
8100	Processor 0 failed BIST
8101	Processor 1 failed BIST
8104	Processor 0 Internal Error (IERR) failure
8105	Processor 1 Internal Error (IERR) failure
8106	Processor 0 Thermal Trip failure
8107	Processor 1 Thermal Trip failure
8108	Watchdog Timer failed on last boot, BSP switched
810A	Processor 1 failed initialization on last boot
810B	Processor 0 failed initialization on last boot
810C	Processor 0 disabled, system in Uni-processor mode
810D	Processor 1 disabled, system in Uni-processor mode
810E	Processor 0 failed FRB Level 3 timer
810F	Processor 1 failed FRB Level 3 timer
8110	Server Management Interface failed to function
8120	IOP sub-system is not functional
8150	NVRAM Cleared by Jumper
8151	NVRAM Checksum Error, NVRAM cleared
8152	NVRAM Data Invalid, NVRAM cleared

5 Technical Reference

This chapter includes the following:

- Environmental specifications
- System memory map addresses
- Board interrupts
- Standard video modes
- Electromagnetic Compatibility (EMC) notices

Connectors

The figure shows connector locations on the system board. This section provides pin information about the connectors.

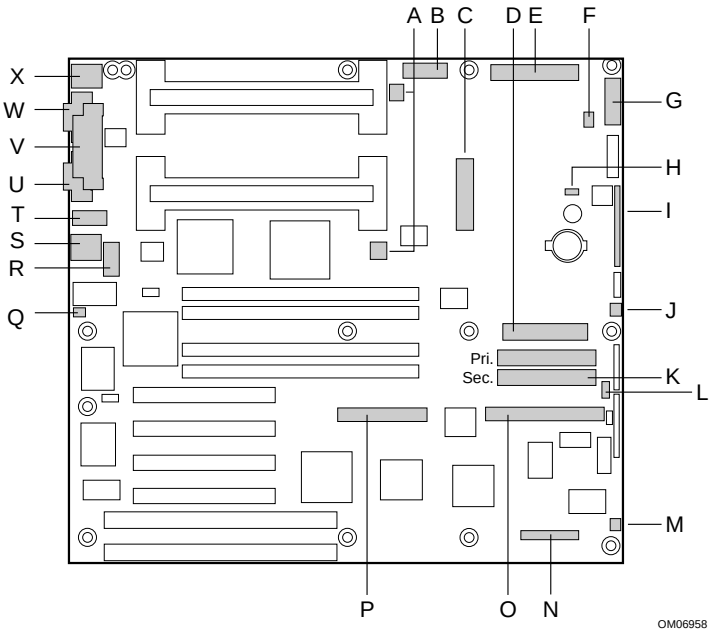

Figure 17. Connector Locations

A. Processor Heatsink fan connectors
B. Aux power connector
C. ATX power connector
D. Diskette drive connector
E. Main power connector
F. Hard drive LED connector
G. Front panel connector, 16 pin
H. Speaker connector
I. AT front panel connector
J. System fan connector (fan1)
K. IDE connectors, primary and secondary
L. External IMB connector
M. System fan connector (fan2)
N. Server monitor module (SMM) connector
O. Narrow SCSI connector
P. Wide SCSI connector
Q. Chassis intrusion connector
R. USB header
S. RJ-45 network connector
T. Serial port 2 header
U. VGA monitor port
V. Parallel port connector
W. Serial port 1 connector
X. Keyboard and Mouse PS/2 compatible connectors

ATX Power Connector

Table 11. ATX Power Connector Pinout

Pin	Signal	Wire color	Pin	Signal	Wire color
1	+3.3 VDC	Orange	11	+3.3 VDC 3.3 V sense	Orange Brown
2	+3.3 VDC	Orange	12	-12 VDC	Blue
3	COM	Black	13	COM	Black
4	+5 VDC	Red	14	PS-ON_L	Green
5	COM	Black	15	COM	Black
6	+5 VDC	Red	16	COM	Black
7	COM	Black	17	COM	Black
8	PWR-OK	Grey	18	-5 VDC	White
9	5 VSB	Purple	19	+5 VDC	Red
10	+12 VDC	Yellow	20	+5 VDC	Red

Main Power Connector

Table 12. Main Power Connector Pinout

hPin	Signal	Wire Color	Pin	Signal	Wire Color
1	+5 VDC	Red	7	COM	Black
13	+5 VDC	Red	19	COM	Black
2	+5 VDC	Red	8	COM	Black
14	+5 VDC	Red	20	COM	Black
3	-5 VDC	White	9	COM	Black
15	+5 VDC	Red	21	COM	Black
4	-12 VDC	Blue	10	+3.3 VDC	Orange
16	+5 VDC	Red	22	+3.3 VDC	Orange
5	COM	Black	11	+12V	Yellow
17	COM	Black	23	+3.3 VDC	Orange
6	COM	Black	12	+12 VDC	Yellow
18	COM	Black	24	+12 VDC	Yellow

Auxiliary Power (non-ATX Connector)

Table 13. Auxiliary Power Connector Pinout

Pin	Signal	Wire color
1	5V Remote sense return	Black
2	5 V remote sense	Red
3	3.3 V remote sense	Orange
4	3.3V remote sense return	Black
5	Not connected	none
6	Not connected	none
7	GND	Black
8	POWER_GOOD	Gray
9	PS_ON	Green
10	COM *	Black
11	5 VSB	Purple
12	Key	None
13	Not connected	None
14	COM	Black

Diskette Drive

Table 14. Diskette Drive Connector Pinout

Pin	Signal	Pin	Signal
1	GND	18	FD_DIR_L
2	FD_DENSEL	19	GND
3	GND	20	FD_STEP_L
4	N/C	21	GND
5	Key	22	FD_WDATA_L
6	FD_DRATE0	23	GND
7	GND	24	FD_WGATE_L
8	FD_INDEX_L	25	GND
9	GND	26	FD_TRK0_L
10	FD_MTR0_L	27	FD_MSEN0
11	GND	28	FD_WPROT_L
12	FD_DR1_L	29	GND
13	GND	30	FD_RDATA_L
14	FD_DR0_L	31	GND
15	GND	32	FD_HDSEL_L
16	FD_MTR1_L	33	GND
17	FD_MSEN1	34	FD_DSKCHG_L

Front Panel Connector

Table 15. Front Panel Connector Pinout

Pin	Signal	Pin	Signal
1	GND	2	Hard disk activity LED
3	Front panel reset switch	4	Front panel power switch
5	+5V	6	NC
7	Front panel NMI switch	8	+5V
9	Fan failure indicator LED	10	Chassis intrusion switch
11	Power fault LED	12	+5v standby
13	I^2C Data line	14	GND
15	I^2C Clock line	16	GND

AT-Style Front Panel Connector

Table 16. AT Style Front Panel Connector Pinout

Pin	Signal
1	Power button
2	GND
3	+5V
4	Key
5	HD LED
6	+5V
7	+5V
8	NC
9	GND
10	GND
11	Reset button

Fan Interface

The system board has four 3-pin, shrouded, and keyed fan connectors. Two are located next to the processor sockets (one for each processor) for a tachometer fan heat sink.

Table 17. Heatsink Fan Connector Pinout

Pin	Signal
1	GND
2	+12V
3	Fan Sensor

The remaining two fan connectors attach to a fans equipped with a sensor that indicates whether the fan is operating. The sensor pins for these fans are routed to the BMC for failure monitoring. Each connector has the following pinout:

Table 18. Chassis Fan Connector Pinout

Pin	Signal
1	GND
2	Fan Sensor
3	+12V

Server Management

Table 19. Server Management Module Connector Pinout

Pin	Signal	Description
1	CPU_SMI_L	System Management Interrupt
2	LOCAL_I2C_SCL	I^2C clock line
3	GND	Ground
4	Reserved	N/A
5	PWR_CNTRL_SFC_L	Host power supply on/off control
6	LOCAL_I2C_SDA	I^2C serial data line
7	5VSTNDBY	+5V standby indication (power OK)
8	KEYLOCK_SFC_L	Keyboard lock signal
9	CPU_NMI	Non-maskable interrupt indication
10	VCC3	3.3V power supply status input
11	RST_SFC_L	System board reset signal from Server Monitor Module
12	GND	Ground
13	GND	Ground
14	Reserved	N/A
15	SECURE_MODE_BMC	Secure mode indication
16	GND	Ground
17	SFC_CHASSIS_INSTRUSION_L	Chassis intrusion indication
18	Reserved	N/A
19	Reserved	N/A
20	GND	Ground
21	Reserved	N/A
22	Reserved	N/A
23	Reserved	Not used
24	Reserved	N/A
25	Key pin (N/C)	Connector key
26	Reserved	N/A

IMB

Table 20. IMB Connector Pinout

Pin	Signal
1	LOCAL_I2C_SCL
2	GND
3	LOCAL_I2C_SDA

VGA Video Port

Table 21. Video Port Connector Pinout

Pin	Signal	Pin	Signal
1	Red	9	NC
2	Green	10	GND
3	Blue	11	NC
4	NC	12	DDCDAT
5	GND	13	HSYNC
6	GND	14	VSYNC
7	GND	15	DDCCLK
8	GND		

Keyboard and Mouse

The are functionally equivalent.

Table 22. Keyboard and Mouse Connector Pinouts

Pin	Keyboard signal	Pin	Mouse signal
1	KEYDAT	1	MSEDAT
2	NC	2	NC
3	GND	3	GND
4	FUSED_VCC (+5 V)	4	FUSED_VCC (+5 V)
5	KEYCLK	5	MSECLK
6	NC	6	NC

Parallel Port

Table 23. Parallel Port Connector Pinout

Pin	Signal	Pin	Signal
1	STROBE_L	10	ACK_L
2	Data bit 0	11	Busy
3	Data bit 1	12	PE
4	Data bit 2	13	SLCT
5	Data bit 3	14	AUFDXT_L
6	Data bit 4	15	ERROR_L
7	Data bit 5	16	INIT_L
8	Data bit 6	17	SLCTIN_L
9	Data bit 7	18–25	GND

Serial Ports A and B

Table 24. Serial Port A (External) Connector Pinout

Pin	Signal	Description
1	DCD	Data carrier detected
2	RXD	Receive data
3	TXD	Transmit data
4	DTR	Data terminal ready
5	GND	Ground
6	DSR	Data set ready
7	RTS	Return to send
8	CTS	Clear to send
9	RIA	Ring indication active

Table 25. Serial Port B (Internal) Header Pinout

Pin	Signal	Description
1	DCD	Data carrier detected
2	DSR	Data set ready
3	RXD	Receive data
4	RTS	Return to send
5	TXD	Transmit data
6	CTS	Clear to send
7	DTR	Data terminal ready
8	RIA	Ring indication active
9	GND	Ground
10	NC	No connect

RJ-45 Network

Table 26. RJ-45 Network Connector Pinout

Pin	Signal	Description
1	TX+	Transmit data plus—the positive signal for the TD differential pair contains the serial output data stream transmitted onto the network
2	TX-	Transmit data minus—the negative signal for the TD differential pair contains the same output as pin 1
3	RX+	Receive data plus—the positive signal for the RD differential pair contains the serial input data stream received from the network
4	NC	
5	NC	
6	RX-	Receive data minus—the negative signal for the RD differential pair contains the same input as pin 3
7	NC	
8	NC	

Narrow SCSI

Table 27. Narrow SCSI Connector Pinout

Pin	Signal	Pin	Signal
1	GND	26	TERMPWR
2	SCD0_L	27	RESERVED
3	GND	28	RESERVED
4	SCD1_L	29	GND
5	GND	30	GND
6	SCD2_L	31	GND
7	GND	32	SATN_L
8	SCD3_L	33	GND
9	GND	34	GND
10	SCD4_L	35	GND
11	GND	36	SBSY_L
12	SCD5_L	37	GND
13	GND	38	SACK_L
14	SCD6_L	39	GND
15	GND	40	SRESET_L
16	SCD7_L	41	GND
17	GND	42	SMSG_L
18	SCDP_L	43	GND
19	GND	44	SSEL_L
20	GND	45	GND
21	GND	46	SCD_L
22	GND	47	GND
23	RESERVED	48	SREQ_L
24	RESERVED	49	GND
25	NC	50	SIO_L

Wide SCSI

Table 28. Wide SCSI Connector Pinout

Pin	Signal	Pin	Signal
1-16	GND	49-50	GND
17	TERMPWR	51	TERMPWR
18	TERMPWR	52	TERMPWR
19	NC	53	NC
20-34	GND	54	GND
35	SCD12_L	55	SATN_L
36	SCD13_L	56	GND
37	SCD14_L	57	SBSY_L
38	SCD15_L	58	SACK_L
39	SCDPH_L	59	RESET_L
40	SCD0_L	60	SMSG_L
41	SCD1_L	61	SSEL_L
42	SCD2_L	62	SCD_L
43	SCD3_L	63	SREQ_L
44	SCD4_L	64	SI/O_L
45	SCD5_L	65	SCD8_L
46	SCD6_L	66	SCD9_L
47	SCD7_L	67	SCD10_L
48	SCDP_L	68	SCD11_L

IDE

Table 29. IDE Connector Pinout

Pin	Signal	Pin	Signal
1	RESET_L	21	IDEDRQ
2	GND	22	GND
3	DD7	23	DIOW_L
4	DD8	24	GND
5	DD6	25	DIOR_L
6	DD9	26	GND
7	DD5	27	IORDY
8	DD10	28	CSEL (1 KΩ p/d)
9	DD4	29	IDEDAK_L
10	DD11	30	GND
11	DD3	31	IDEIRQ
12	DD12	32	Reserved (N/C)
13	DD2	33	IDESA1
14	DD13	34	PDIAG_L (tied to GND)
15	DD1	35	IDESA0
16	DD14	36	IDESA2
17	DD0	37	IDECS1_L
18	DD15	38	IDECS3_L
19	GND	39	IDEHDACT_L
20	Keyed	40	GND

If no IDE drives are present, there should be no IDE cable connected. If only one IDE drive is installed, it must be connected at the end of the cable.

ISA

Table 30. ISA Connector Pinout

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
A1	IOCHK_L	B1	GND	A26	SA5	B26	DACK2_L
A2	SD7	B2	RESET	A27	SA4	B27	TC
A3	SD6	B3	+5V	A28	SA3	B28	BALE
A4	SD5	B4	IRQ9	A29	SA2	B29	+5V
A5	SD4	B5	-5V	A30	SA1	B30	OSC
A6	SD3	B6	DRQ2	A31	SA0	B31	GND
A7	SD2	B7	-12V	Connector key		Connector key	
A8	SD1	B8	SRDY_L	C1	SBHE_L	D1	MEMCS16_L
A9	SD0	B9	+12V	C2	LA23	D2	IOCS16_L
A10	IOCHRDY	B10	GND	C3	LA22	D3	IRQ10
A11	AEN	B11	SMEMW_L	C4	LA21	D4	IRQ11
A12	SA19	B12	SMEMR_L	C5	LA20	D5	IRQ12
A13	SA18	B13	IOW_L	C6	LA19	D6	IRQ15
A14	SA17	B14	IOR_L	C7	LA18	D7	IRQ14
A15	SA16	B15	DACK3_L	C8	LA17	D8	DACK0_L
A16	SA15	B16	DRQ3	C9	MEMR_L	D9	DRQ0
A17	SA14	B17	DACK1_L	C10	MEMW_L	D10	DACK5_L
A18	SA13	B18	DRQ1	C11	SD8	D11	DRQ5
A19	SA12	B19	REFRESH_L	C12	SD9	D12	DACK6_L
A20	SA11	B20	BCLK	C13	SD10	D13	DRQ6
A21	SA10	B21	IRQ7	C14	SD11	D14	DACK7_L
A22	SA9	B22	IRQ6	C15	SD12	D15	DRQ7
A23	SA8	B23	IRQ5	C16	SD13	D16	+5V
A24	SA7	B24	IRQ4	C17	SD14	D17	MASTER16_L
A25	SA6	B25	IRQ3	C18	SD15	D18	GND

PCI

Table 31. PCI Connector Pinout

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
A1	TRST_L	B1	-12 V	A32	AD16	B32	AD17
A2	+12 V	B2	TCK	A33	+3.3 V *	B33	CBE2_L
A3	TMS	B3	GND	A34	FRAME_L	B34	GND
A4	TDI	B4	TD0 (NC)	A35	GND	B35	IRDY_L
A5	+5 V	B5	+5 V	A36	TRDY_L	B36	+3.3 V *
A6	INTA_L	B6	+5 V	A37	GND	B37	DEVSEL_L
A7	INTC_L	B7	INTB_L	A38	STOP_L	B38	GND
A8	+5 V	B8	INTD_L	A39	+3.3 V *	B39	LOCK_L
A9	Reserved	B9	PRSNT1_L	A40	SDONE	B40	PERR_L
A10	+5 V	B10	Reserved	A41	SBO_L	B41	+3.3 V *
A11	Reserved	B11	PRSNT2_L	A42	GND	B42	SERR_L
A12	GND	B12	GND	A43	PAR	B43	+3.3 V *
A13	GND	B13	GND	A44	AD15	B44	CBE1_L
A14	Reserved	B14	Reserved	A45	+3.3 V *	B45	AD14
A15	RST_L	B15	GND	A46	AD13	B46	GND
A16	+5 V	B16	PCICLK	A47	AD11	B47	AD12
A17	GNT_L	B17	GND	A48	GND	B48	AD10
A18	GND	B18	REQ_L	A49	AD9	B49	GND
A19	Reserved	B19	+5 V	A50	KEY	B50	KEY
A20	AD30	B20	AD31	A51	KEY	B51	KEY
A21	+3.3 V *	B21	AD29	A52	CBE0_L	B52	AD8
A22	AD28	B22	GND	A53	+3.3 V *	B53	AD7
A23	AD26	B23	AD27	A54	AD6	B54	+3.3 V *
A24	GND	B24	AD25	A55	AD4	B55	AD5
A25	AD24	B25	+3.3 V *	A56	GND	B56	AD3
A26	IDSEL	B26	CBE3_L	A57	AD2	B57	GND
A27	+3.3 V *	B27	AD23	A58	AD0	B58	AD1
A28	AD22	B28	GND	A59	+5 V	B59	+5 V
A29	AD20	B29	AD21	A60	REQ64_L	B60	ACK64_L
A30	GND	B30	AD19	A61	+5 V	B61	+5 V
A31	AD18	B31	+3.3 V *	A62	+5 V	B62	+5 V

* The system board does not provide a PCI 3.3 V power connector. Only the 5 V PCI signaling environment is supported, and no power is available at the 3.3 V signal pins in expansion slots.

Server Board Jumpers

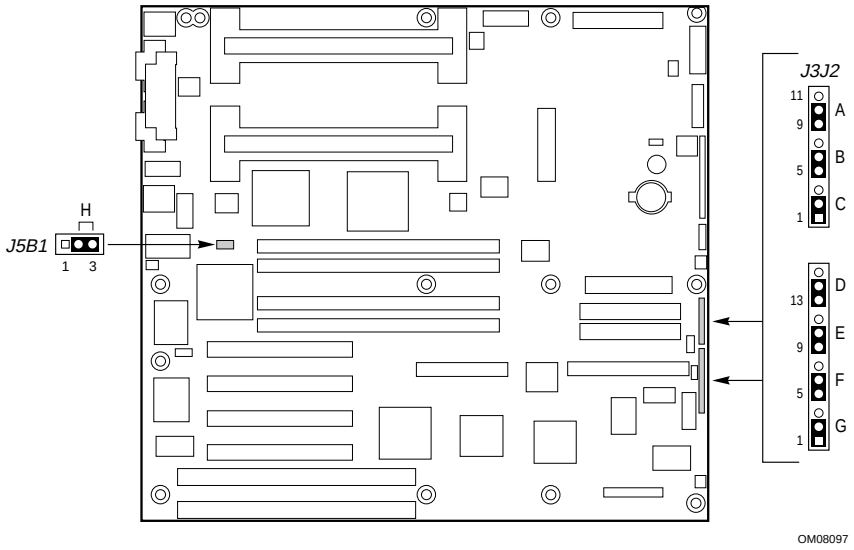

Figure 18. Jumper Locations

Table 32. Server Board Jumper Summary

Jumper Block	Pins (default in bold)	What it does at system reset
A BMC Forced Update Mode	**9-10, Normal**	System boots normally.
	10-11, Program	System tries to update BMC firmware.
B Chassis Intrusion Detection	**5-6, Enable**	Switch installed on chassis indicates when cover has been removed.
	6-7, Disable	Chassis intrusion switch is bypassed.
C FRB Timer Enable	**1-2, Enable**	FRB operation is enabled (system boots from processor 1 if processor 0 fails).
	2-3, Disable	FRB is disabled.
D Boot Block Write Protect	**13-14, Protect**	BIOS boot block is write-protected.
	14-15 Erase/Program	BIOS boot block is erasable and programmable.
E Recovery Boot	**9-10, Normal**	System attempts to boot using the BIOS stored in flash memory.
	10-11, Recovery	BIOS attempts a recovery boot, loading BIOS code from a floppy diskette into the flash device. This is typically used when the BIOS code has been corrupted.

continued

Table 32. Server Board Jumper Summary (continued)

Jumper Block	Pins (default in bold)	What it does at system reset
F Password clear	**5-6, Protect**	Maintains the current system password.
	6-7, Erase	Clears the password.
G CMOS clear	**1-2, Protect**	Preserves the contents of NVRAM.
	2-3, Erase	Replaces the contents of NVRAM with the manufacturing default settings.
H BMC boot block write protect	**1-2, Protect**	BMC boot block is wrote protected.
	2-3, Erase/Program	BMC boot block is erasable and programmable.
I WOL Enable	1-2, Disabled	Disables Wake On LAN. If your power supply does not provide 0.8 A of +5 V Standby current, you must move the WOL Enable jumper to this position.
	2-3, Enabled	Enables Wake On LAN.

General Procedure to Change Jumper Setting

The short general procedure for changing a configuration setting is the same for most of the jumper functions, so we will describe it here.

1. Observe the safety and ESD precautions at the beginning of this chapter.
2. Turn off all connected peripherals, turn off system power, and disconnect the AC power cord.
3. Remove the side cover. You do not need to remove the system board from the chassis, and you probably do not need to remove any add-in boards.
4. Locate the configuration jumpers at the edge of the system board toward the front of the system.
5. Move jumper to pins specified for the desired setting.
6. Reinstall the side cover, connect the power cord, and turn on the system for the change to take effect.
7. You may need to repeat these steps to move the jumper back to its original setting, depending on the jumper function.

CMOS Jumper

The jumper at pins 1, 2, and 3 controls whether settings stored in CMOS nonvolatile memory (NVRAM) are retained during a system reset.

Procedure to restore the system's CMOS and RTC to default values:

1. See "General Procedure to Change Jumper Setting" on page 109.
2. Move the CMOS jumper from pins 1 and 2 to pins 2 and 3 (the Clear CMOS memory position).
3. Reinstall the side cover for your safety, and connect the power cord to the system.
4. Turn the system on. Wait for POST to complete and for the messages "NVRAM cleared by jumper" and "Press F2 to enter Setup" to appear. This automatically reprograms CMOS and RTC to their default settings.
5. Enter Setup and make any changes necessary (for example, changing the boot device). Press F10 to save the new Setup configuration and exit Setup.
6. Turn off the system, and disconnect the power cord from the system.
7. Again remove the side cover.
8. Move the jumper from pins 2 and 3 back to pins 1 and 2 (the Protect CMOS memory position).
9. Reinstall the side cover, and connect the power cord to the system.
10. Run BIOS Setup or the SSU to verify the correct settings. See Chapter 3.

Password Jumper

The jumper at pins 5, 6, and 7 controls whether the user and administrative passwords are retained or cleared during a system reset.

Procedure to clear the current password and then enter a new one:

1. See "General Procedure to Change Jumper Setting" on page 109.
2. Move the Password jumper from pins 5 and 6 to pins 6 and 7.
3. Reinstall the side cover for your safety, and connect the power cord to the system.
4. Turn the system on, and wait for POST to complete. This automatically clears the password.
5. Turn off the system, and disconnect the power cord.
6. Again remove the side cover.
7. Move the jumper from pins 6 and 7 back to pins 5 and 6.
8. Reinstall the side cover, and connect the power cord to the system.
9. Run the SSU to specify a new password. See Chapter 3.

Recovery Boot Jumper

The jumper at pins 9, 10, and 11 controls whether the system attempts to boot using the BIOS programmed in the boot block area of the FLASH memory. This should only be used if the operational area of the BIOS is corrupted or needs to be upgraded. Contact your local service representative before doing this.

Procedure to disable recovery booting:

1. See "General Procedure to Change Jumper Setting" on page 109.
2. Move the recovery boot jumper from pins 9 and 10 to pins 10 and 11.

3. Reinstall the side cover for your safety, connect the power cord to the system.
4. Turn the system on, and insert the Flash Memory Update Utility diskette in drive A. After the system boots, the speaker emits a single beep and the recovery process starts. This takes about three minutes. When the recovery process completes, the speaker emits two beeps.

While in the recovery mode, there is no screen display on the monitor. The keyboard is disabled as the system automatically recovers the BIOS. The following beep codes describe the recovery status.

Beep Code	Message
2	Successful completion, no errors.
4	The system could not boot from the diskette. The diskette may not be bootable.
Continuous series of low beeps	The wrong BIOS recovery files are being used and/or the flash memory jumper is in the wrong position.

5. Turn the system off, disconnect the power cord(s) from the system, and remove the left side cover.
6. Move the jumper from pins 9 and 10 to pins 10 and 11 to enable the normal boot mode.
7. Replace the left side cover, remove the diskette from drive A, and connect the power cord(s) to the system.
8. After running the special recovery mode, run the SSU to specify a new password. See Chapter 3.

Boot Block Write Protect Jumper

The jumper at pins 13, 14, and 15 controls whether the BIOS boot block is protected from being erased and reprogrammed.

⚠ CAUTION

Leave boot block jumper at factory-default setting: Programming the boot block incorrectly will prevent the system from booting. Programming *should only be done* by a technically qualified person. The procedure requires a special "Boot Block Update Utility." Contact your dealer or sales representative for more information.

Procedure to permit boot block erasing and programming:

1. See "General Procedure to Change Jumper Setting" on page 109.
2. Move the boot block jumper from pins 13 and 14 to pins 14 and 15 to erase and program the BIOS boot block.
3. Reinstall the side cover for your safety, and connect the power cord to the system.
4. Run the Boot Block Update Utility.
5. Turn off the system, and disconnect the power cord from the system.
6. Remove the side cover.
7. Move the jumper from pins 14 and 15 back to pins 13 and 14 to write protect the BIOS boot block.
8. Reinstall the side cover, and connect the power cord to the system.

FRB Timer Enable Jumper

The jumper at pins 5, 6, and 7 controls the FRB timers. See page 79.

Procedure to disable FRB timer:

1. See “General Procedure to Change Jumper Setting” on page 109.
2. Move the recovery boot jumper from pins 5 and 6 to pins 6 and 7.
3. Reinstall the side cover for your safety, and connect the power cord to the system.
4. Turn the system on, and wait for POST to complete.
5. Run the SSU to configure the system. See Chapter 3.

Chassis Intrusion Detection Jumper

The chassis contains an alarm switch that sends a notification signal to the server management software if a cover is removed. The jumper at pins 9, 10, and 11 controls whether this alarm feature is enabled or disabled.

Procedure to disable (bypass) the chassis intrusion switch:

1. See “General Procedure to Change Jumper Setting” on page 109.
2. Move the chassis intrusion detection jumper from pins 9 and 10 to pins 10 and 11 to disable the alarm switch.
3. Reinstall the side cover for your safety, and connect the power cord to the system.
4. Turn the system on, and wait for POST to complete.
5. Run the SSU to configure the system. See Chapter 3.

To enable the intrusion switch, do the above steps but move the jumper back to pins 9 and 10.

Interrupts

The table below recommends the logical interrupt mapping of interrupt sources; it reflects a typical configuration. Use the information to determine how to program each interrupt. The actual interrupt map is defined using configuration registers in the PIIX4 and the I/O controller. I/O Redirection Registers in the I/O APIC are provided for each interrupt signal; the signals define hardware interrupt signal characteristics for APIC messages sent to local APIC(s).

NOTE

To disable either IDE controller and reuse the interrupt: if you plan to disable either IDE controller to reuse the interrupt for that controller, you must physically unplug the IDE cable from the board connector (IDE0 or IDE1) if a cable is present. Simply disabling the drive by configuring the SSU option does not free up the interrupt.

Table 33. Interrupts

Interrupt	I/O APIC level	Description
INTR	INT0	Processor interrupt
NMI	N/A	NMI from BUD to processor
IRQ0	INT2	Timer interrupt from PIIX4
IRQ1	INT1	Keyboard interrupt
IRQ2		Interrupt signal from second 8259 in PIIX4
IRQ3	INT3	Serial port A or B interrupt from 87309VLJ device (user can configure)
IRQ4	INT4	Serial port A or B interrupt from 87309VLJ device (user can configure)
IRQ5	INT5	Open for use
IRQ6	INT6	Diskette
IRQ7	INT7	Parallel port
IRQ8_L	INT8	RTC interrupt
IRQ9	INT9	Reserved for SCI (ACPI)
IRQ10	INT10	Open for use
IRQ11	INT11	Open for use
IRQ12	INT12	Mouse interrupt
	INT13	
IRQ14	INT14	Compatibility IDE interrupt from primary channel IDE devices 0 and 1
IRQ15	INT15	Secondary IDE interrupt
PCI_INTA_L	INT16	PCI Interrupt signal A
PCI_INTB_L	INT17	PCI Interrupt signal B
PCI_INTC_L	INT18	PCI Interrupt signal C
PCI_INTD_L	INT19	PCI Interrupt signal D

Video Modes

The 5480 integrated video controller provides all standard IBM VGA modes. With 1 MB of video memory, the system goes beyond standard VGA support. The tables below show all supported video modes using 1 MB of video memory. The following tables show the standard modes that the chip supports, including the number of colors and palette size, resolution, pixel frequency, and scan frequencies.

Table 34. Standard VGA Modes

Mode(s) in Hex	Bits per pixel	Colors (no per palette size)	Resolution	Pixel Freq. (MHz)	Horizontal Freq. (kHz)	Vertical Freq. (Hz)
0, 1	4	16/256K	360 X 400	14	31.5	70
2, 3	4	16/256K	720 X 400	28	31.5	70
4, 5	4	4/256K	320 X 200	12.5	31.5	70
6	4	2/256K	640 X 200	25	31.5	70
7	4	Mono	720 X 400	28	31.5	70
D	4	16/256K	320 X 200	12.5	31.5	70
E	4	16/256K	640 X 200	25	31.5	70
F	4	Mono	640 X 350	25	31.5	70
10	4	16/256K	640 X 350	25	31.5	70
11	4	2/256K	640 X 480	25	31.5	60
12	4	16/256K	640 X 480	25	31.5	60
12+	4	16/256K	640 X 480	31.5	37.5	75
13	8	256/256K	320 X 200	12.5	31.5	70

Table 35. Extended VGA Modes

Mode(s) in Hex	Bits per pixel	Colors	Resolution	Pixel Freq. (MHz)	Horiz. Freq. (kHz)	Vert. Freq. (Hz)	Min. Memory
58, 6A	8	16/256K	800 X 600	36	35.2	56	1MB
58, 6A	8	16/256K	800 X 600	40	37.8	60	1MB
58, 6A	8	16/256K	800 X 600	50	48.1	72	1MB
58, 6A	8	16/256K	800 X 600	49.5	46.9	75	1MB
5C	8	256/256K	800 X 600	36	35.2	56	1MB
5C	8	256/256K	800 X 600	40	37.9	60	1MB
5C	8	256/256K	800 X 600	50	48.1	72	1MB
5C	8	256/256K	800 X 600	49.5	46.9	75	1MB
5C	8	256/256K	800 X 600	56.25	53.7	85	1MB
5C	8	256/256K	800 X 600	68.2	63.6	100	1MB
5D	8	16/256K (interlaced)	1024 X 768	44.9	35.5	43	1MB
5D	8	16/256K	1024 X 768	65	48.3	60	1MB
5D	8	16/256K	1024 X 768	75	56	70	1MB
5D	8	16/256K	1024 X 768	78.7	60	75	1MB
5E	8	256/256K	640 X 400	25	31.5	70	1MB
5F	8	256/256K	640 X 480	25	31.5	60	1MB
5F	8	256/256K	640 X 480	31.5	37.9	72	1MB
5F	8	256/256K	640 X 480	31.5	37.5	75	1MB
5F	8	256/256K	640 X 480	36	43.3	85	1MB
5F	8	256/256K	640 X 480	43.2	50.9	100	1MB
60	8	256/256K (interlaced)	1024 X 768	44.9	35.5	43	1MB
60	8	256/256K	1024 X 768	65	48.3	60	1MB
60	8	256/256K	1024 X 768	75	56	70	1MB
60	8	256/256K	1024 X 768	78.7	60	75	1MB
60	8	256/256K	1024 X 768	94.5	68.3	85	1MB
60	8	256/256K	1024 X 768	113.3	81.4	100	1MB
64	16	64K	640 X 480	25	31.5	60	1MB
64	16	64K	640 X 480	31.5	37.9	72	1MB
64	16	64K	640 X 480	31.5	37.5	75	1MB
64	16	64K	640 X 480	36	43.3	85	1MB
64	16	64K	640 X 480	43.2	50.9	100	1MB
65	16	64K	800 X 600	36	35.2	56	1MB
65	16	64K	800 X 600	40	37.8	60	1MB
65	16	64K	800 X 600	50	48.1	72	1MB
65	16	64K	800 X 600	49.5	46.9	75	1MB

continued

Table 35. Extended VGA Modes (continued)

Mode(s) in Hex	Bits per pixel	Colors	Resolution	Pixel Freq. (MHz)	Horiz. Freq. (kHz)	Vert. Freq. (Hz)	Min. Memory
65	16	64K	800 X 600	56.25	53.7	85	1MB
65	16	64K	800 X 600	68.2	63.6	100	1MB
66	16	32K	640 X 480	25	31.5	60	1MB
66	16	32K	640 X 480	31.5	37.9	72	1MB
66	16	32K	640 X 480	31.5	37.5	75	1MB
66	16	32K	640 X 480	36	43.3	85	1MB
66	16	32K	640 X 480	43.2	50.9	100	1MB
67	16	32K	800 X 600	36	35.2	56	1MB
67	16	32K	800 X 600	40	37.8	60	1MB
67	16	32K	800 X 600	50	48.1	72	1MB
67	16	32K	800 X 600	49.5	46.9	75	1MB
67	16	32K	800 X 600	56.25	53.7	85	1MB
67	16	32K	800 X 600	68.2	63.6	100	1MB
68	16	32K (interlaced)	1024 X 768	44.9	35.5	43	2MB
68	16	32K	1024 X 768	65	48.3	60	2MB
68	16	32K	1024 X 768	75	56	70	2MB
68	16	32K	1024 X 768	78.7	60	75	2MB
68	16	32K	1024 X 768	94.5	68.3	85	2MB
68	16	32K	1024 X 768	113.3	81.4	100	2MB
6C	8	16/256K (interlaced)	1280 X 1024	75	48	43	1MB
6D	8	256/256K (interlaced)	1280 X 1024	75	48	43	2MB
6D	8	256/256K	1280 X 1024	108	65	60	2MB
6D	8	256/256K	1280 X 1024	135	80	75	2MB
6D	8	256/256K	1280 X 1024	157.5	91	85	2MB
6E	16	32K	1152 X 864	94.5	63.9	70	2MB
6E	16	32K	1152 X 864	108	67.5	75	2MB
6E	16	32K	1152 X 864	121.5	76.7	85	2MB
6E	16	32K	1152 X 864	143.5	91.5	100	2MB
71	24	16M	640 X 480	25	31.5	60	1MB
71	24	16M	640 X 480	31.5	37.9	72	1MB
71	24	16M	640 X 480	31.5	37.5	75	1MB
71	24	16M	640 X 480	36	43.3	85	1MB
71	24	16M	640 X 480	43.2	50.9	100	1MB

continued

Table 35. Extended VGA Modes (continued)

Mode(s) in Hex	Bits per pixel	Colors	Resolution	Pixel Freq. (MHz)	Horiz. Freq. (kHz)	Vert. Freq. (Hz)	Min. Memory
74	16	64K (interlaced)	1024 X 768	44.9	35.5	43	2MB
74	16	64K	1024 X 768	65	48.3	60	2MB
74	16	64K	1024 X 768	75	56	70	2MB
74	16	64K	1024 X 768	78.7	60	75	2MB
74	16	64K	1024 X 768	94.5	68.3	85	2MB
74	16	64K	1024 X 768	113.3	81.4	100	2MB
78	16	32K	800 X 600	36	35.2	56	1MB
78	24	16M	800 X 600	40	37.8	60	2MB
78	24	16M	800 X 600	50	48.1	72	2MB
78	24	16M	800 X 600	49.5	46.9	75	2MB
78	24	16M	800 X 600	56.25	53.7	85	2MB
78	24	16M	800 X 600	68.2	63.6	100	2MB
7B	8	256/256K (interlaced)	1600 X 1200	135	62.5	48	2MB
7B	8	256/256K	1600 X 1200	162	75	60	2MB
7C	8	256/256K	1152 X 864	94.5	63.9	70	1MB
7C	8	256/256K	1152 X 864	108	67.5	75	1MB
7C	8	256/256K	1152 X 864	121.5	76.7	85	1MB
7C	8	256/256K	1152 X 864	143.5	91.5	100	1MB
7D	16	64K	1152 X 864	94.5	63.9	70	2MB
7D	16	64K	1152 X 864	108	67.5	75	2MB
7D	16	64K	1152 X 864	121.5	76.7	85	2MB
7D	16	64K	1152 X 864	143.5	91.5	100	2MB

6 Information for Computer Integrators

Regulatory Requirements

This server board complies with the following safety and electromagnetic compatibility (EMC) regulations when correctly installed in a compatible host computer.

Safety Standards

UL 1950 - CSA 950-95, 3rd Edition, July 28, 1995

The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (USA and Canada)

CSA C22.2 No. 950-95, 3rd Edition, July 28, 1995

The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (Canada)

EN 60 950, 2nd Edition, 1992 (with Amendments 1, 2, and 3)

The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (European Union)

IEC 950, 2nd edition, 1991 (with Amendments 1, 2, 3 and 4)

The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (International)

EMKO-TSE (74-SEC) 207/94

Summary of Nordic deviations to EN 60 950. (Norway, Sweden, Denmark, and Finland)

EMC Regulations

FCC Class B

Title 47 of the Code of Federal Regulations, Parts 2 and 15, Subpart B, pertaining to unintentional radiators. (USA)

CISPR 22, 2nd Edition, 1993, Amendment 1, 1995

Limits and methods of measurement of Radio Interference Characteristics of Information Technology Equipment. (International)

EN 55 022, 1995

Limits and methods of measurement of Radio Interference Characteristics of Information Technology Equipment. (Europe)

EN 50 082-1, 1992

Generic Immunity Standard. Currently, compliance is determined via testing to IEC 801-2, - 3 and - 4. (Europe)

VCCI Class B (ITE)

Implementation Regulations for Voluntary Control of Radio Interference by Data Processing Equipment and Electronic Office Machines. (Japan)

ICES-003, Issue 2

Interference-Causing Equipment Standard, Digital Apparatus. (Canada)

Spectrum Management Agency (SMA) — Australian C-Tick Compliance

Limits and methods of measurement of Radio Interference Characteristics of Information Technology Equipment. (Australian Regulation based on International CISPR 22 Requirements)

New Zealand Ministry of Commerce

Limits and methods of measurement of Radio Interference Characteristics of Information Technology Equipment. (New Zealand Regulation based on International CISPR 22 Requirements - New Zealand Authorities accept SMA C-Tick Compliance Mark)

Product Certification Markings

This server board has the following product certification markings:

- European CE Mark
  - — Marking on the board assembly and/or shipping container.
- UL Recognition Mark
  - — Marking is a stylized backward UR and UL File No. E139761 on the component side of the board and the PB No. on the solder side of the board. Board material flammability is 94V-1 or -0.
- Canadian Compliance Mark
  - — Marking is a small c followed by a stylized backward UR on the component side of the board.
- Australian SMA C-Tick Compliance Mark
  - — Marking is a solid circle with a white tick-like mark within the circle, accompanied by the four-digit supplier code.

Installation Instructions

⚠ CAUTION

Follow these guidelines to meet safety and regulatory requirements when installing this board assembly.

Read and adhere to all of these instructions and the instructions supplied with the host computer and associated modules. If the instructions for the host computer are inconsistent with these instructions or the instructions for associated modules, contact the supplier's technical support to find out how you can ensure that your computer meets safety and regulatory requirements. If you do not follow these instructions and the instructions provided by host computer and module suppliers, you increase safety risk and the possibility of non-compliance with regional laws and regulations.

Ensure EMC

Before computer integration, make sure that the host chassis, power supply, and other modules have passed EMC certification testing.

In the installation instructions for the host chassis, power supply, and other modules pay close attention to the following:

- Certifications (see "Ensure Host Computer and Accessory Module Certifications" on page 122.)
- External I/O cable shielding and filtering
- Mounting, grounding, and bonding requirements
- Keying connectors when mismating of connectors could be hazardous

If the host chassis, power supply, and other modules have not passed applicable EMC certification testing before integration, EMC testing must be conducted on a representative sample of the newly completed computer.

Ensure Host Computer and Accessory Module Certifications

Make sure that the host computer, any added subassembly (such as a board or drive assembly, including internal or external wiring), are certified for the region(s) where the end-product will be used. Marks on the product are proof of certification. Certification marks are as follows:

In Europe

The CE marking signifies compliance with all relevant European requirements. If the host computer does not bear the CE marking, obtain a supplier's Declaration of Conformity to the appropriate standards required by the European EMC Directive and Low Voltage Directive. Other directives, such as the Machinery and Telecommunications Directives, may also apply depending on the type of product. No regulatory assessment is necessary for low voltage DC wiring used internally or wiring used externally when provided with appropriate overcurrent protection. Appropriate protection is provided by a maximum 8-Amp current limiting circuit or a maximum 5-Amp fuse or positive temperature coefficient (PTC) resistor. This Intel server board has PTCs on all external ports that provide DC power externally.

In the United States

A certification mark by a Nationally Recognized Testing Laboratory (NRTL) such as UL, CSA, or ETL signifies compliance with safety requirements. External wiring must be UL Listed and suitable for the intended use. Internal wiring must be UL Listed or Recognized and rated for applicable voltages and temperatures. The FCC mark (Class A for commercial or industrial only or Class B for residential) signifies compliance with electromagnetic interference requirements.

In Canada

A nationally recognized certification mark such as CSA or cUL signifies compliance with safety requirements. No regulatory assessment is necessary for low-voltage DC wiring used internally or wiring used externally when provided with appropriate overcurrent protection. Appropriate protection is provided by a maximum 8-Amp current limiting circuit or a maximum approved 5-Amp fuse or positive temperature coefficient (PTC) resistor. This server board has PTCs on all external ports that provide DC power externally.

Prevent Power Supply Overload

Do not overload the power supply output. To avoid overloading the power supply, make sure that the calculated total current load of all the modules within the computer is less than the maximum output current rating of the power supply. If you do not do this, the power supply may overheat, catch fire, or damage the insulation that separates hazardous AC line circuitry from low-voltage user accessible circuitry and result in a shock hazard. If the load drawn by a module cannot be determined by the markings and instructions supplied with the module, contact the module supplier's technical support.

Place Battery Marking on Computer

There is insufficient space on this server board to provide instructions for replacing and disposing of the battery. The following warning must be placed permanently and legibly on the host computer as near as possible to the battery.

WARNING

Danger of explosion if battery is incorrectly replaced.

Replace with only the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Use Only for Intended Applications

This product was evaluated for use in ITE computers that will be installed in offices, schools, computer rooms and similar locations. The suitability of this product for other product categories other than ITE applications, (such as medical, industrial, alarm systems, and test equipment) may require further evaluation.

Installation Precautions

When you install and test the server board, observe all warnings and cautions in the installation instructions.

To avoid injury, be careful of:

- Sharp pins on connectors
- Sharp pins on printed circuit assemblies
- Rough edges and sharp corners on the chassis
- Hot components (like processors, voltage regulators, and heat sinks)
- Damage to wires that could cause a short circuit

Observe all warnings and cautions that instruct you to refer computer servicing to qualified technical personnel.

WARNING

Do not open the power supply. Risk of electric shock and burns from high voltage and rapid overheating. Refer servicing of the power supply to qualified technical personnel.

7 Equipment Log and Power Consumption Worksheets

Equipment Log

Use the blank equipment log provided here to record information about your system. You will need some of this information when you run the SSU.

Item	Manufacturer Name and Model Number	Serial Number	Date Installed
System			
Server board			
Primary Processor speed and cache			
Secondary Processor speed and cache			
Video display			
Keyboard			
Mouse			
Diskette drive A			
Diskette drive B			
Tape drive			
CD-ROM drive			
Hard disk drive 1			
Hard disk drive 2			
Hard disk drive 3			
Hard disk drive 4			
Hard disk drive 5			

continued

Equipment Log (continued)

Item	Manufacturer Name and Model Number	Serial Number	Date Installed

Current Usage

As an overall current usage limitation on the power supply, do not exceed a combined power output of 167 watts for the +5 and +3.3 volt outputs.

The ISA slots on the server board are rated at a maximum of 4.5 amperes per slot. The ISA specification recommends supporting an average of 2.0 amperes per slot. The average current usage should not exceed 3.0 amperes per slot; that is, 15 watts.

The PCI slots on the server board are rated at a maximum of 5 amperes per slot. The maximum power allowed for each slot is 20 watts at +5 volts. The average current usage per slot should not exceed 3.0 amperes per slot; that is, 15 watts.

The cooling efficiency varies per slot; therefore, ensure that adequate cooling is available in the target slot—especially in an expansion slot drawing more than 2.0 amperes.

Calculating Power Consumption

The total combined wattage for the system configuration must be less than the output of your power supply. Use the two worksheets in this section to calculate the power used by your system boards. For current and voltage requirements of add-in boards and peripherals, see your vendor documents.

Worksheet, Calculating DC Power Usage

1. List the current for each board and device in the appropriate voltage level column.
2. Add the currents in each column. Then go to the next worksheet.

Table 36. Power Usage Worksheet 1

	Current (maximum) at voltage level:				
Device	+3.3 V	+5 V	–5 V	+12 V	–12 V
Server board	1.0 A	8.0 A	0.1 A	1.1 A	0.4 A
Primary Processor					
Secondary Processor (if present)					
Terminator card, if no second processor	1.6 A				
Memory (four 128 MB DIMMs)	1.8 A	0.3 A			
PCI slot 1					
PCI slot 2					
PCI slot 3					
ISA slot 1					
ISA slot 2					
1st 3.5-inch hard disk drive					
2nd 3.5-inch hard disk drive					
3rd 3.5-inch hard disk drive					
4th 3.5-inch hard disk drive					
5th 3.5-inch hard disk drive					
6th 3.5-inch hard disk drive					
3.5-inch diskette drive					
CD-ROM drive					
Cooling fan 1					
Total Current					

Worksheet, Total Combined Power Used by the System

1. From the previous worksheet, enter the total current for each column.
2. Multiply the voltage by the total current to get the total wattage for each voltage level.
3. Add the total wattage for each voltage level to arrive at a total combined power usage on the power supply.

Table 37. Power Usage Worksheet 2

Voltage level and total current (V X A = W)	**Total Watts for each voltage level**
(+3.3 V) X (_____ A)	_____ W
(+5 V) X (_____ A)	_____ W
(–5 V) X (_____ A)	_____ W
(+12 V) X (_____ A)	_____ W
(–12 V) X (_____ A)	_____ W
Total Combined Wattage	_____ **W**

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